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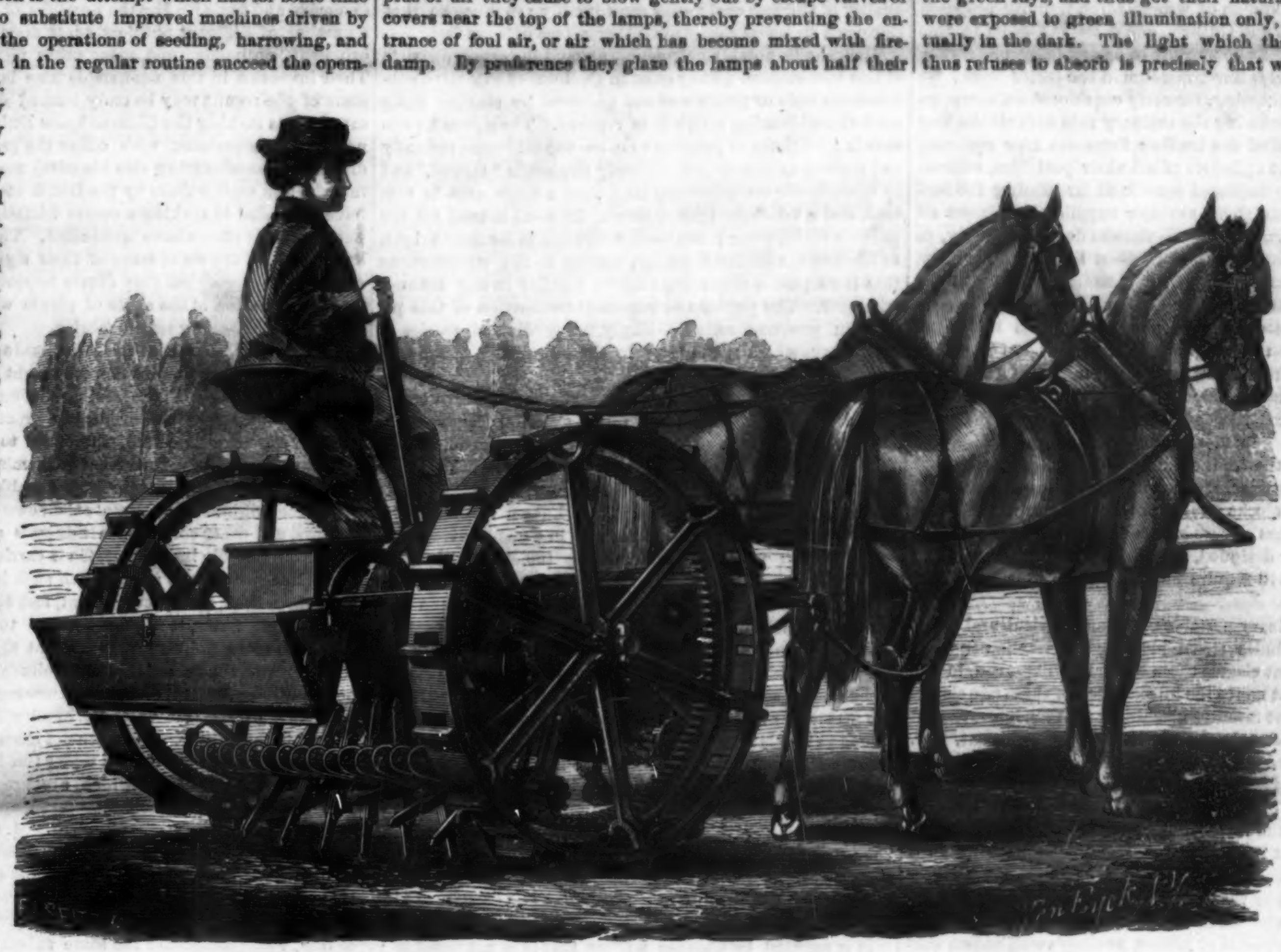
Improvement in Sulky Harrows.

Almost daily our practice as patent solicitors confirms the view often expressed in these columns, that agriculture as an art is undergoing a mechanical revolution. The universal adoption of power machines for cultivating the soil is all that remains to render the revolution complete. The first step in this direction is the attempt which has for some time been in progress to substitute improved machines driven by horse power, for the operations of seeding, harrowing, and cultivating, which in the regular routine succeed the operation of plowing. The machine plow driven either by steam or horse power—most probably the former—will follow in due time.

The machine illustrated herewith is a Maryland invention, and it received a first class premium (a gold medal) at the late State Fair, Maryland.

It performs the operation of what is known as "broadcast" seeding and harrowing simultaneously, and as the inventor assures us, at the rate of from ten to fifteen acres per day; at the same time it distributes uniformly any fertilizers of a pulverulent character. It may be taken upon newly plowed land without any previous preparation of rolling, harrowing, etc., and is said to perform its work under such circumstances in a very satisfactory manner.



TAVEAU'S REVOLVING SULKY HARROW AND BROADCAST SEEDER.

The depth of the harrowing is controlled by the driver, and can be instantaneously adjusted to any required depth. The seeding is controlled by easily adjustable gages, requiring only a few seconds of time for their adjustment, without the employment of a wrench or hammer. We are informed that long and thorough trial of this machine has fully demonstrated the justness of the claims made for it, and its general applicability to all soils adapted to the production of cereals.

The revolving harrow is driven by pinions actuated by the inside teeth of the driving wheels, and is propelled with considerable velocity, its teeth penetrating and comminuting the soil, incorporating the fertilizer, and covering the seed to the proper depth.

The seed of grain crops is carried in a forward box, from whence it is scattered by an apparatus driven by rag-wheels and an endless chain belt.

When grass seed is also to be sown, it is carried in a box to the rear of the machine, and is delivered by a cam movement as wanted, and is strewn over the even and pulverized surface, thus being left in the best position to sprout when moistened by ensuing rain. The hand lever shown in the engraving as grasped by the left hand of the driver, acts through a toothed quadrant and a toothed segment to raise or lower the revolving harrow, and may be fixed when the required depth is attained by notches in an arc provided for that purpose.

Foot levers serve to throw the harrow and seeding apparatus in or out of gear. The driver is thus enabled to control the operation of the machine without neglecting his driving, and this control, it is claimed, requires so little effort that a boy or an infirm man may perform it without undue fatigue.

This invention was patented through the Scientific American Patent Agency, May 4, 1869, by Augustin L. Taveau, of Chaptico, St. Mary's county, Maryland, to whom, or R. Sinclair & Co., Baltimore, Md., communications for State rights may be addressed.

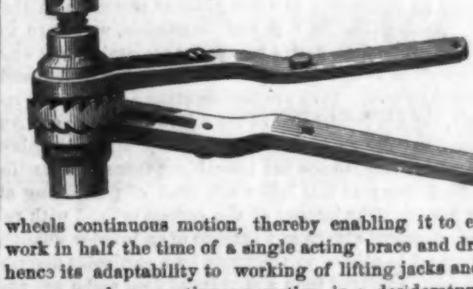
None deserve success less than those who will not earn it, and no others grumble so much at Providence.

Lighting Mines with Gas.

In improving the method of lighting mines, M. Wilkin and J. Clark, of Paddington, London, propose to use lamps, burning gas, oil, or other illuminating materials, with air propelled from a pure source at the bottom or top of the shaft, through air-tight tubes, to the interior of the lamps. An overplus of air they cause to blow gently out by escape valves or covers near the top of the lamps, thereby preventing the entrance of foul air, or air which has become mixed with fire-damp. By preference they glaze the lamps about half their hight with glass; the upper half they prefer to make of sheet metal to withstand the heat. When gas lamps are used, the gas is produced, and conveyed in pipes in the usual way. The air is propelled through the tubes referred to by any well-understood method; such as by fans, air pumps, steam jet, etc. In lighting the lamps, they propose to use safety matches. After the match is inserted into the lamp by an escape valve, it is struck, and the lamp is lighted, while the match is extinguished in a tube into which it is thrust.

DOUBLE RATCHET BRACE.

A new double ratchet brace, just out in England, is shown in our engraving. It is constructed with double ratchet teeth, pawls, and levers, which, on being moved from and toward each other simultaneously, impart to the ratchet



wheels continuous motion, thereby enabling it to effect its work in half the time of a single acting brace and drill, and hence its adaptability to working of lifting jacks and other purposes where continuous motion is a desideratum. By connecting the handles and using them as one the brace is rendered single acting.

The Senate Committee on Patents, at the last meeting, had under consideration the bill for the extension of the Corliss steam engine patent, and agreed to report on it adversely. The Committee has caught the spirit of the President's late veto message, and intends scrutinizing very carefully all applications for extension of patents.

Light and Life.

It has been proved by recent researches in France that the *red* rays of the spectrum are those to which the important physiological function exercised by the sun on plants is exclusively to be ascribed. The leaves act as analyzers of the white light which falls upon them; they reject and reflect the green rays, and thus get their natural color. If plants were exposed to green illumination only, they would be virtually in the dark. The light which the vegetable world thus refuses to absorb is precisely that which is coveted by animals. Red, the complementary color of green, is that which, owing to the blood, tinges the skin of the healthy human subject, just as the green color of plants is the complement of what they absorb. These facts have been fully stated and illustrated in a paper read by M. Dubrunfaut before the French Academy of Science; and from them he deduces certain practical suggestions.

All kinds of red should be avoided in our furniture, except curtains; our clothes, which play the part of screens, should never be green. This color should predominate in our furniture, while the complementary red should be reserved for our raiment. He also dwells upon the salubrious influences of sunshine. He mentions cases of patients whose broken constitutions were restored by continued exposure to the sun in gardens where there were no trees; and gives an account of four children that had become weak and sickly by living in a narrow street in Paris, but regained their health under the influence of the solar rays on a sandy sea coast.—*Boston Journal of Chemistry.*

AGRICULTURAL ENGINEERING.

Year after year those who visit our exhibitions of agricultural machinery become witnesses of a steady progress—a progress that is doubtless more rapid in some departments than others, but still a progress in all. Let us take agricultural steam engines, for example. To a careless, or an unprofessional observer, the portable engine of to-day may appear the same as those exhibited seven or eight years ago; but a more careful examination will show numerous points of improvement, each of them small perhaps in itself; but still amounting in the aggregate to something important. Thus, in the first place, the workmanship generally—and particularly that of the smaller firms—is better than it used to be; while proportions also are better, and more care is taken to provide ample bearing surfaces and efficient means of lubrication. The pressure of steam carried is also gradually creeping up—though but slowly—and portables working regularly at 70 lb., 80 lb., and 90 lb., per square inch, are now to be met with. In this respect, however, our English makers are still decidedly behind their Continental neighbors. With higher pressure have come improvements in the boiler work, and it is now but comparatively seldom that we meet with such miserably constructed, insufficiently stayed boilers, as were but too commonly fitted to portable engines a few years ago. Still, however, there is room for further improvement in this direction. We should like to see the evil practice of placing a large manhole at the side of the firebox casing abolished, and greater facilities for washing out provided in the form of well arranged mud-plugs. A mud collector also under the barrel of the boiler would do good service, and add scarcely anything to the cost of the engine. The flat-topped form of firebox casing, having the crown stayed directly to the crown

of the inside firebox, which is now becoming a favorite with many locomotive engineers on the Continent, might also be adopted for portable engines in many instances with undoubted advantage, and with a noticeable saving not only of dead weight but we believe of cost also; while in the case of all engines worked at the higher pressures we hope soon to see the longitudinal lap joints superseded by welded joints or by butt-joints with inside and outside covering strips. All engines, too, without exception should be provided with two safety valves,and more care should be taken to protect the boiler by efficient cleaning than is now generally the case. These latter matters we know all involve extra expense; but they are worth all they cost and much more, and this fact will be appreciated one of these days. As pressures increase, too, it will be found advisable to relieve the boiler of the strain due to the working of the engine by connecting the cylinder and crank shaft plummer blocks by framing of some kind, the boiler being of course allowed to expand and contract freely. On the Continent, in fact, this is even now very generally done by the fixing of the engine proper on a cast-iron base plate, which is in its turn fitted to the top of the boiler; and this plan, although somewhat clumsy, undoubtedly had its advantages. The system of wrought-iron framing proposed by Messrs. Hartnell and Guthrie, and described by us in this journal a few months ago appears to us decidedly preferable.

Then, again, besides improvements in the boiler work, we find that steam jacketing, formerly considered an extra refinement, is now becoming the ordinary rule with all the best makers, and several of the leading firms are now applying steam jackets to the cylinders of all their portables, without exception. Arrangements of some kind for heating the feed water by the exhaust steam are now supplied by almost all makers, and the practice—at one time so dear, apparently, to the hearts of agricultural engineers—of leading the exhaust pipe through the boiler, is rapidly becoming a thing of the past. In the construction of the various details, steel is coming extensively into use, and portable engines with steel crank shafts, piston rods, guide bars, and even connecting rods, are now far from being rare. In speaking of guide bars, we may remark that agricultural steam-engine builders appear to us to generally spend more money on these details than is necessary. In most instances cast-iron guides, cast in one piece with the front cylinder cover, will answer every purpose. Such guides, if provided with ample surface, and if the crosshead blocks are of proper materials, will wear quite as well as bars of case-hardened wrought iron or steel, while, if properly designed, they will present no unsightly appearance, and will require no adjustment after being put in place.

Besides the ordinary portables, the term agricultural steam engines now includes steam plowing and traction engines, and most important classes these both are. There can, in fact be little doubt that it is to the introduction of these two classes of engines amongst farming machinery that the improvement of the ordinary portable engine is, to a great extent, due. Steam plowing and traction engines are called upon to perform work which is probably, taken altogether, more severe than that to which engines of any other class are exposed; and it is only by the employment of the best materials and workmanship that the heavy wear and tear induced by such work can be withstood. In fact, the plowing engines now sent into the field by the great Leeds firm, for instance, fully equal in design and workmanship the best locomotive practice, and the same may be said of Messrs. Aveling's well known traction engines. Year by year, too, the conviction is gaining ground that the more powerful the engine and tackle employed, the more economically steam cultivation can be carried out; and thus it is that the 12 and 14-horse power engines formerly employed are being supplanted by steam plowing engines rated at 20, 24, and 30 nominal horse power—engines working with steam at 130 lb. and 140 lb. per square inch, and developing from 60 to 120-horse power indicated—and stronger and stronger implements and accessories. Where this increase in the power of steam plowing machinery will end we cannot say; but it is certain that it has not yet reached its limits, nor is it perhaps likely to do so for some years to come.

It is, however, not only in the construction of agricultural steam engines that agricultural engineers have made progress during the past few years. A noble advance has been made in the general application of light iron and steel framing to reaping and mowing machines, horse-rakes, plows and other implements in place of the cumbrous wooden frames which were formerly universal; while the more extensive use of malleable and toughened castings of various kinds has done much to insure freedom from breakages, and extra durability has been obtained by providing more efficient means of lubricating working parts.—*Engineering.*

ANCIENT AND MODERN INDUSTRIES OF THE CHINESE.

Despite the offerings of peace and the threats of war, despite the presence of a foreign foe within the walls of its capital, and the burning of an imperial residence, China still refuses to receive the evidences of civilization. She cannot be taught to understand that in the present time nations cannot any more than individuals, exist solitary and secluded, and that national prosperity and advancement are in direct ratio to the extent and frequency of the intercommunication with other countries. Although there has been a colony of European race established on her own shores, she is deaf, blind, and dumb to their habits and customs, and persists, with invincible obstinacy, in refusing to accept anything from the hand of the "barbarian." Her mechanical inventions and appliances, her trades, manufactures, her government and legislation, are virtually the same now as they were during the dynasty of Shang, who reigned some thousand years or so B. C. Her progress has literally been *nil.* The China of to-day is in every sense the Kathay of ancient times, the land famous for the skill of its magicians, its Aladdins, and the slaves of the ring and the lamp. No improvements, alterations, or modifications have ever attended their mechanical operations, or broken the uninterrupted monotony of their manufactures, their page of progress is a blank.

Of coal there is no lack in China, and there are two precautions adopted by the natives in working the mines which might be imitated with advantage among ourselves. Whenever gas of a mephitic or inflammable character is encountered in the pits, a bamboo tube is introduced throughout the various workings, terminated at the lower extremity by a conical point. This is inserted in the fiery or dangerous seam, and the gas conducted away to the external atmosphere. A timber framework is erected occasionally to support the roof, but only for so long as it is required to maintain a free passage underneath. When there is no further necessity for it the general practice is to fill up the excavated spaces by earth well rammed in and consolidated. All "creeps" and fallings in the roof are thus avoided. The quality of Chinese coal varies considerably; so much so, that European steamers rarely avail themselves of it for fuel.

Mineral oils, notably petroleum, abound in certain districts of this vast empire. They exist in the form of extensive subterranean beds or ponds, and are procured by sinking wells until the oil-bearing stratum is reached. The upward pressure is sometimes so great as to cause the oil to rise violently and rapidly to the surface—directly the bed is "tapped," and to spread over the adjoining land until a large area is covered, and a veritable lake formed. This oil is used for the purpose of lighting; but its illumination is far from bright, as the flame is dull and smoky, owing to the circumstance that the liquid is never distilled or purified in any manner whatever. The partial and imperfect combustion of this petroleum produces an exceedingly finely divided species of lampblack, which is employed in the preparation of the well known "*encre de Chine*"—China ink.

With the exception of the seasoning and preservation of articles of food, the inhabitants of the Celestial Empire make but little use of salt. It has no industrial application among them. Marine salt, rock salt, and two or three other varieties common to nearly every other country, are indigenous to the land. There is also a description known as efflorescent salt, which is found in some localities in a manner very similar to that in which niter appears in India. A simple but rather ingenious method is employed for raising the salt liquid from wells sunk to reach a saline substratum. A long bamboo is hollowed out, and a valve, opening inwards, is fixed to the lower end. This is lowered down and sunk into the liquid, which rises through the valve into the hollow bamboo. As soon as it is considered to be full it is hauled up, the pressure of the contained fluid keeping the valve close. In one particular province the salt pits are not free from an inflammable gas. This is utilized for heating the boilers in which the saline liquid is evaporated, thus proving that the natives have an eye to the economy of fuel. The boilers are erected near the pits, and the gas brought to them in bamboo tubes, furnished with a copper burner. In the northern portions of the realm, salt is used for preserving and embalming the bodies of defunct mandarins and officials of high position.

It is asserted by Chinese writers that it is not possible to travel thirty miles in any part of the country, without meeting with either a calcareous or carbonaceous stone fit for the manufacture of lime. This may be a piece of national metaphor; but M. Champion, author of a recent work on the industries of China, indorses the statement that the raw material is exceedingly abundant, and that the manufactured produce has a very extensive application. One of the most original of these is the fabrication of receptacles or vessels for the transport of oils and varnishes, which, is carried on upon a large scale throughout the kingdom. In this manufacture, as well as in every other that we shall notice, the everlasting bamboo plays an important part. It is difficult to imagine what the Chinaman would do, or what he would be, without the bamboo. If we were to be deprived of iron, wood, stone, brick, coal, glass, or any one particular element adapted for the purposes of construction or convenience, we should not be long without a substitute; indeed, we have frequently reviewed and discussed such a contingency without demonstrating much alarm at the possibility of its occurrence. But to ask a Chinaman what he would do, were he deprived of bamboo, would be equivalent to asking him to speculate on the infinite. Apologizing for this little digression, we return to the manufacture of the native vessels for containing oils and varnishes which exercise a corrosive action upon metals and organic substances. They are neither casks nor metallic receptacles, but are constructed in the following manner: An open carcass or frame is made of small pieces of bamboo closely intertwined, somewhat resembling those little trellis stands for flower pots that ladies are fond of purchasing at Covent garden. The interior of the carcass is lined with paper, manufactured also from a bamboo of an inferior quality, and is caused to adhere to the frame by a particular description of paste, prepared from a mixture of flour and a hot and strong solution of gelatin. This lining is covered by a layer of mastic composed of lime, sand, and a paste made from peas When it is dried it is in its turn covered with paper, and the vessel is complete and ready for sale.

The element sulphur occupies the first position of the seventy-two substances included in the Chinese category of "useful," and is obtained from the ore by the ordinary process of roasting. It is used medicinally, in the treatment of ulcers, and to protect the bamboo from the attacks of insects and vermin. The preparation of sulphur, and its sale, is a business which requires especial permission from the authorities, and cannot be carried on, like the salt trade by any one who chooses. Similarly to the ancient alchemists, the Celestial philosophers have some curious notions respecting chemical products. Thus they regard sulphur as a male principle, and saltpeter as a female. The union of the two gives rise to the powder which explodes at the contact with a flame. Saltpeter, or niter, is found in China as an efflorescent production, and one of its chief applications is to the manufacture of gunpowder. If any proof were required to demonstrate the utter stagnation of the nation's industry it would be seen in this example. Notwithstanding that this destructive agent was known centuries ago, its manufacture and character has not advanced a step. At this very day Chinese gunpowder is large grained. The components are imperfectly mixed and incorporated; the inflammability is small compared with that of our own powder, and it fouls the interior of cannons and gun barrels to a degree that renders accurate firing a sheer impossibility. Although their method of manufacturing and preparing explosive and detonating powders is crude and imperfect, their acquaintance with them is very extensive and varied. For the purposes of war they employ a number of different powders, containing arsenic, cinnabar, orpiment, antimony, and many other metallic ingredients. Their invention in this unenviable line is very prolific, and some of the results may be truly termed diabolical. Of the art of glass making the Chinese know little or nothing, and never were acquainted with either the process or the ingredients for manufacturing this beautiful material. Since the introduction among them by the Dutch of cobalt blue, they have succeeded in making a coarse imitation of lapis-lazuli, but here their efforts have terminated. The substances soda and potash, in the strict sense of their signification, are also unknown to them; but they obtain impure solutions of them by the lixiviation of the ashes of plants which they use for purposes of bleaching textile fabrics.

All Orientals, as well as the inhabitants of tropical countries, have a strong predilection for bright colors. This gipsy love of color is one of the distinguishing characteristics of the Zingari, and may be considered a proof of their exotic origin. We are not surprised, therefore, to discover that the Chinese are perfectly conversant with mineral colors, which are invariably more intense and durable than those of a vegetable origin. They prepare their own reds, blues, greens, yellows, and other colors, from minerals existing in the soil, and a considerable internal traffic is carried on in these articles. In a people who adhere with such invincible obstinacy to by-gone time, that past, present, and future, are for them synonymous terms, it is only natural to expect that they should be more familiar with ancient than modern science. This explains the reason that the Celestials are by no means ignorant of chemistry, although knowing but little of the numerous useful and valuable applications of which that science is susceptible. They are not ignorant of the peculiar double salts which are classed under the head of alums, the various preparations of which are procured by processes nearly analogous to those employed among ourselves, and are applied to the same purposes. M. Champion observes that while the chemical knowledge of the Chinese is not to be despised, they take very little trouble about disseminating that knowledge. There is no recognized nomenclature, so that in one province black alum is represented by sulphate of iron, while in another the same substance appears as sulphate of copper.—*The Engineer.*

The Cuttle Fish.

Mr. L. L. Hartt, in his "Chapter on Cuttle Fishes," in the *American Naturalist,* describes his encounter with one of these octopods on the coast of Brazil, which wound its long arms, covered with numerous suckers, around his hands in such such a way as to hold him prisoner for a short time. On relinquishing its hold it dropped on the sand, and using its long, slimy arms as legs, made its way toward the water, looking like a huge and very tipsy spider. The cuttle fish belongs to the mollusks, a branch of the animal kingdom distinguished for its members being built upon the plan of a sac, and to which Mr. Hyatt has appplied the more appropriate name of *Saccata.* It is distinguished from all other mollusks, such as snails, clams, etc., by having a very large head, a pair of large eyes, and a mouth furnished with a pair of jaws, around which are arranged, in a circle, eight or ten arms furnished with suckers. In the common cuttle fish or squid of our coast, the body, which is long and narrow, is wrapped in a muscular cloak or mantle, like a bag, fitting tightly to the back, but loose in front. It is closed up to the neck, where it is open like a loosely-fitting overcoat, buttoned up to the throat. Attached to its throat, by a bridle,is a short tube,open at both ends. This tube or siphon, can be moved about in any direction. The animal breathes by means of gills, which are attached to the front of the body, inside the cloak, and look like the ruffles of a shirt-bosom. By means of these gills the air contained in the water is breathed, and they answer the same purpose for the cuttle fish that our lungs do for us. In order to swim, the animal swells out the cloak in front, so that the water flows in between it and the body. Then it closes the cloak tightly about the neck, so that the only way the water can get out is through the siphon. Then it contracts forcibly its coat, and the water is driven out in a jet from the siphon, and the body is propelled in an opposite direction, like a rocket through the water. This siphon is flexible, like a water hose, and can be bent so as to direct the stream, not only forward, but sideways and backward, so that the animal can move in almost any direction, and turn summersaults with perfect ease; and so rapidly do some cuttle fishes swim, that they are able to make long leaps out of the water,

Usually, however, the animal swims backward, with its long arms trailing behind. Our common cuttle fish of this coast has, in addition to its eight arms, two long, slender tenacles, which may be withdrawn into the body. The tail is pointed and furnished with a fin on each side. The octopods, to which the Brazilian cuttle fish belongs,have round,purse-like bodies, and eight arms, united at the base with a web, and they swim by opening and shutting their arms like an umbrella; in this mode of swimming they resemble the jelly fish. The paper nautilus is nothing in the world but a female cuttle fish that builds a shell. There was a very pretty story told of her habits by Aristotle, the old Greek naturalist,which everybody believed until quite lately. He said she rode on the top of the waves, seated in her boat-like shell, and spreading her broad arms to the winds for sails. But, unfortunately, the story has no foundation in fact. She either crawls about on the bottom of the sea, or swims quite like other cuttle fish, shell foremost, only occasionally coming to the surface. Strangely enough, she holds the two broad, hand-like extremities of the arms against her body, and it is the inside of these arms that secrete the paper-like shell, which is only a sort of cradle for her eggs. Not so with the pearly nautilus, which is furnished with a beautiful, coiled-up, pearly shell, formed on the outside of the animal. The shell is divided into numerous chambers, and the animal, living in the outer one, builds a partition across the back part of it as the shell grows. Cuttle fishes are sometimes used for food by the Brazilians, and different species may be seen in the markets, where one frequently finds them still alive. Sometimes, as we stoop to examine one, its body is suddenly suffused with a deep pinkish glow. Before we have the time to recover our surprise, this color fades, and a beautiful blue takes its place as rapidly as a blush sometimes diffuses a delicate cheek. The blue, perhaps, is succeeded by a green, and then the whole body becomes pink again. One can hardly conceive anything more beautiful than this rapid play of colors, which is produced by the successive distension of sets of little sacks containing fluids of colors which are situated under the skin. The cuttle-fish is also furnished with a bag containing an inky fluid, which, when the animal is attacked or pursued, it ejects into the water, thus completely blinding its adversary and effectual y covering its retreat. It is from this fluid the color sepia is made. Besides carrying an ink-bottle, some species of cuttle fish are provided with a long, delicate, horny pen, which forms a sort of stiffener to the back. In some species the pen is hard, thick, and broad, and the cuttle fish bone of commerce is of this kind. The species found in our waters is very small, and not at all dangerous, being barely large enough to draw blood from the hand; but in the tropical seas they are very large, powerful, and dangerous. The cuttle fish is the original of Victor Hugo's devil fish so vividly described in the "Toilers of the Sea." If the devil fish were a beneficent one, Mr. Hartt says he should be sorry to destroy our faith in it; but as it is, he believes it will be rather a relief than otherwise to know, that in some important respects Victor Hugo's story of it is a fable. The Kraken was a mythical cuttle fish of fabulous size.

MANUFACTURE OF INDIAN INK.

From the Mechanics' Magazine.

A very large proportion of our readers are probably in the habit of using what we term Indian ink, or, at any rate, have used it during some portion of their lifetime. The term, although very ancient, is a complete misnomer. That employed by the French, *encre de Chine*, is the more correct and the one which has some tangible reference to the country whence this indispensable accessory to the drawing office is exported to our shores. A brief account of the method of manufacturing it in the ancient land of Kathay will not be without interest, the more especially as all attempts to prepare it of an equal quality, in this country or on the continent, have altogether failed. In times so remote as almost to carry us back to the ages of fable, the Chinese executed their specimens of caligraphy through the agency of a piece of bamboo dipped in a kind of black varnish. Subsequently, while the same *stylus* was retained, the liquid was represented by a s'rupy fluid, in which particles of a black stone reduced to an impalpable powder were held in mechanical suspension. Later still, the ink assumed the appearance and nature of solid black balls, prepared from lampblack, and ever since their introduction this branch of industry has been gradually improved until it attained its present state of perfection. At the present day, the Chinese keep their ink in sticks, rub it with water or tea, and write by means of very fine pointed pencils dipped in it. The quality of the ink varies considerably, and depends upon the purity of the ingredients of which it is composed, and the care and skill displayed in its preparation. Among the best substances from which to obtain the lampblack are—firstly, pig's fat; secondly, ordinary oils and fats; and thirdly, resinous woods and resins themselves. Tolerably good inks are also made from the lampblack produced by the combustion of pine trees, and some other descriptions of timber indigenous to the country.

The materials from which the lampblack is procured are placed in a furnace about one hundred feet in length, and five in breadth, along the sides and top of which it condenses. That which condenses at the extremity of the furnace is the best adapted for the manufacture of the ink, while the rest, which is deposited near the neighborhood of the combustion, is too coarse in grain to be employed for the purpose. This evidently results from two causes. One is the quality of the material, and the other the relative rapidity with which it is consumed. Having obtained the lampblack, the next step is to prepare a particular kind of paste or glue with which to form a compact and solid substance. The preparation of this glue requires a great deal of care, and is one of the most important operations connected with the whole process. The best description is made from the horns of deer. After removing the outer skin, the horns are macerated for a period of seven days in rice water, and then subjected to a long and exhausting ebullition. It is only during the cold season of the year that this process is carried on, as hot weather would cause the fermentation of the glue and retard the operation. It must not be imagined that the lampblack is fit for use directly it is taken out of the furnace. On the contrary, it requires to be sifted through silken bags, so that the grains may all be of the same size, or otherwise the ink would not be homogeneous. This preliminary condition being insured, a certain quantity of the glue is melted and poured over an equal quantity of the other ingredient, and the whole thoroughly kneaded and incorporated by the hands. Occasionally a small portion of Chinese varnish is added, and the mixture transferred to an iron mortar, where it is beaten up with some degree of violence. The whole of the value of the future product depends, as is usual in all similar instances, upon the intimacy of the mixture, but, at the same time, the operation must not be protracted to too great a length. It is the duty of the manufacturer to time the process, and when, through negligence or ignorance, the proper time has been exceeded, the error is rectified by enveloping the ink in paper, and holding it before a slow fire, which restores to it its elasticity, and prevents it splitting. In spite, however of this partial remedy, the ink so treated is never equal in quality to that which has not been subjected to such treatment. From the mortar the mixture passes into the hand of the molder. The molds are formed of wood, with a cavity corresponding to the form it is desired to give to the ink. Within certain limits the smaller the cakes the better, as there is less chance of their splitting or warping during the time they are drying. Thus, the best cakes of Indian ink are never of a very large size. As soon as the cakes have acquired a firm and solid consistency, they are removed from the molds and dried. The desiccation is effected by enveloping the ink in very fine paper, and surrounding it by cinders or powdered chalk. When the latter desiccator is used care must be taken that it does not abstract the humidity from the cake with too great rapidity, or the latter will become brittle, and lose its superior quality. The cakes, together with the absorbent envelopes, are placed in a small stove, and kept exposed to a gentle heat for several days. Some manufacturers do not take the trouble to perform this last drying process, but leave the cakes to dry by simple exposure to the air.

M. Paul Champion, in his work entitled "Industries Anciennes et Modernes de l'Empire Chinois," gives some practical suggestions for distinguishing good from bad Indian ink, which will, we do not doubt, be very acceptable to our readers. Ink of a superior quality rubs easily and marks upon paper, without leaving any apparent trace of solid matter. The best cakes have a brownish hue when rubbed. A black, gray, or blue tinge indicates ink of an inferior quality. The brown tinge will remain in cakes for many years after manufacture, and is visible in some very ancient specimens that exist in China. Another somewhat curious test will determine the quality of Indian ink. If a cake of good quality be struck gently on a hard substance, the sound should be sharp. If it be flat, it is a sign that it is not homogeneous in consistency, and belongs to a second class description. Moreover, the heaviest ink is the most valuable. The Chinese say that the value of lampblack depends upon its lightness, and that of ink upon its heaviness, being in the inverse ratio one to the other. As the ink gets older, so, like wine, it improves in quality. It becomes harder without at the same time becoming brittle, and acquires a brilliancy that is highly prized by connoisseurs. Strictly speaking, it ought not to be used for three years after manufacture. Whenever it happens that old ink loses in value by absorbing damp, it may be re-prepared by grinding it with a mixture of glue and water, but the operation is not always successful. In order to keep Indian ink—in other words to preserve it—it should be placed in a well-aired situation, exposed now and then to the action of the sun, and rubbed frequently on the surface to prevent it losing its polish.

The manufacture of Chinese ink, to give it its proper term, is carried on upon a very large scale at Shanghai, where a very superior description is prepared. The difference in quality between the various inks made in China results from the non-employment of a constant material for the production of the lampblack. In order to impart an agreeable odor to the production, the Chinese add a small portion of musk and camphor, from the Isle of Borneo, two articles which are exceedingly dear in the Celestial empire. Ordinary Chinese ink for home use is not scented in any manner whatever. The gilded mystic letters that are so attractive to young pupils and students are first formed by the action of the mold. When the cake is dry, the letters are traced over with a solution of gelatin in water, and the gold or copper is laid on with a fine brush. Like their neighbors, the Japanese manufacture Indian ink, but consider it of a quality inferior to that which they obtain from the mainland. Not having given so much attention to the matter as the Celestials, they are not so well versed in the manner of preparing the lampblack, which is the real secret of the whole art.

The Ransome Process.

Almost every one is familiar with the ordinary process by which Mr. Frederick Ransome manufactures artificial stone, and knows how the sand, mixed with silicate of soda, is treated then with chloride of calcium, with the result of their mutual decomposition and reformation as silicate of lime and chloride of sodium, the former remaining as an indestructible bond throughout the stone, the latter soluble and easily removed. The process, beautiful and simple, can be seen any day in extensive application at the works at East Greenwich. The sand, after being dried, is worked up in a mill with the soluble silicate brewed from caustic soda and flints, the latter being dissolved by the former, and evaporated down to a specific gravity of 1·700. The plastic mass thus produced is obedient to the will of the molder, and can be manipulated into any form, from a cube to elaborate screens, such as those decorating the India Office; from a grindstone to an exquisitely chiseled fountain like that recently erected in the public gardens at Hong Kong. The mass so prepared is then saturated with chloride of calcium, applied either simply by immersion, or assisted by the action of an air pump, in either process the solution being gradually heated to a temperature of 212° Fah. Mr. Ransome has recently made some further important improvements, which promise great results.

These consist, first, in submitting the molded mass to the indurating action of the chloride solution at a higher temperature in closed chambers connected with a steam boiler. When this has been carried on for a sufficient length of time, by opening a cock, the solution is forced by steam pressure into a separate chamber, leaving the stone to cool gradually in a partial vacuo, by which all danger of cracking is avoided —a casualty which is liable to happen when large masses are exposed to rapid extremes of temperature in the open air.

The next feature in these improvements lies in the ingenious method adopted by the inventor for extracting the soluble salts of calcium and sodium from the body of the stone, which is effected in the same closed chamber by the admission of steam (or steam and water alternately), which as it condenses and becomes saturated with the salts referred to, is returned into the boiler, where the steam is generated, and the chloride of calcium is again made available for future operations, thus obviating the serious loss incurred by washing the stone in the way hitherto adopted.

It is gratifying to learn that the manufacture of this stone is being adopted even in most distant parts of the globe. We have already, in previous notices, informed our readers that manufactories have been established for its production in India, America, Australia, Belgium, Denmark, and Sweden. But little actual progress has, however, been made in the practical introduction of the Ransome process in the United States. The proprietors of the patent right for the State of California have established large works in San Francisco, under the title of the Pacific Stone Company, for the production of artificial stone, and, but for the slight drawback of being ignorant of the practical details of the process, would probably have developed an extensive business. Being unable to obtain the necessary information from the American proprietor, and tired of working in the dark, they have at last adopted the most satisfactory and common-sense course of coming from California to Greenwich to learn the whole course of the manufacture at the fountain head. To this end the managing director, and principal shareholder of the Pacific Stone Company, Dr. W. May, has recently arrived from California, and is rapidly acquiring the mysteries of artificial stone manufacture from Mr. Frederick Ransome, by whom every facility is offered for the benefit of American licensees. We mention this because it is a matter much to be regretted that for so long a time the vastly important Ransome process should have remained almost a dead letter in the United States, so far as real utility is concerned; the American proprietor having apparently devoted his attention to making money rather than stone, from his purchased patent right. This is, of course, at an end now, and the manufacture under this patent in America will be so much greater than it is in England as the demand for the production is proportionately increased.—*Engineering.*

THE TANITE SOLID EMERY WHEEL.

We desire to call attention to the advertisement of the Tanite Company in another column. The solid emery wheels made by this company are of the most excellent quality and might be to advantage much more widely used than they are at present, although the present demand for them is great.

The wheel is called the "Tanite Solid Emery Wheel," from the composition, tanite, which holds the solid grains of emery by its cohesive power. This substance is sufficiently strong to hold the emery and yet does not act to interfere with its sharp cutting effect. It does not, it is claimed, glaze, and it wears uniformly. It may be made into other forms as well as into wheels, such as slipstones, blocks for hand use, etc., etc.

Past experience has taught us the great value of emery wheels, as a substitute for files in a great many kinds of work. In fact, we should say that there are very few branches of mechanical work where the materials used are metals, wood, horn, or bone, that such wheels cannot be employed at a great saving of expense both for files and other tools and labor. Certain it is that whenever the emery wheel can be substituted for the file it will result in such saving.

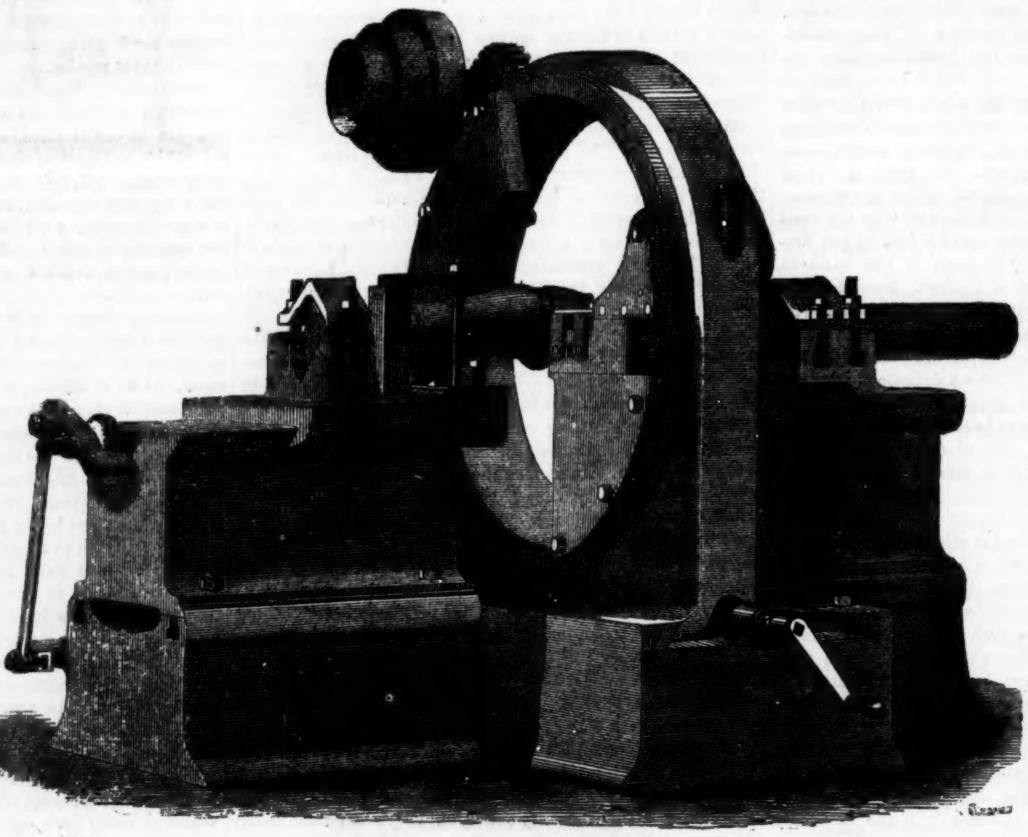
The tanite solid emery wheel is however infinitely superior to the old emery wheel, far more convenient in use, cheaper, and extremely durable. It is also easily kept in order, and free from smell, or from any substance calculated to produce injury by the generation of poisonous dust; and its strength is such that twenty-inch wheels are run at a trial speed of 2,800 revolutions per minute before leaving the shop

THE Smithsonian Institute has published a descriptive list of the *Smithsonian Publications*, to be had on application to the librarian of the institute, at Washington.

Useful Machine for Turning Crank Pins.

We illustrate, annexed, a useful machine for turning crank pins which has been designed and constructed by Craven Brothers, of the Vauxhall Ironworks, Manchester, England. This machine is adapted for turning the crank-pin bearings of bent and other crank shafts, the tool being carried round the bearing while the latter remains stationary. The machine, in fact, belongs to the same class as the large crank-turning machine which is in use at Messrs. Penn's factory at Greenwich, and of which other examples are to be found in some of the large marine engine works on the Continent. In the machine of which we now publish an engraving, the tool is carried by a sliding tool-holder attached to a ring which revolves in V-bearings, and which is driven by a pinion and cone pulleys, as shown. The headstock carrying the bearings for the ring just mentioned is adjustable laterally on slides, and the tool can thus be brought to bear on the pins of cranks of any throw up to 15 inches, the machine being capable of turning cranks of the latter throw with pins of 7¼ inches in diameter.

The crank to be turned is first "slided" in an ordinary lathe on the shaft part, and is then secured in the two V-blocks shown in our engraving. These blocks are formed in one piece with slides which have a self-acting traverse motion, this motion giving the requisite feed. A great advantage with this machine is that the crank bearing is turned truly cylindrical and perfectly parallel with the shaft portion; while, when the headstock is once set to the length of stroke required, any number of cranks may be turned exactly alike. The time required to turn a crank also is less than that required to fix it in an ordinary lathe, and disk plates, balance weights, etc., are entirely dispensed with. One of the machines we have described is now in use at one of the large factories in the neighborhood of Manchester, where it is employed in turning the crank shaft made out of round iron and used for wood-working machinery, etc., and we have no doubt that it will do its work well and economically. The machine could also be adapted for turning locomotive crank axles.—*Engineering.*



MACHINE FOR TURNING CRANK PINS.

Improved Device for Packing Eggs.

Few articles of food are in more universal demand, and more desirable in a sanitary point of view, than fresh eggs, and few articles brought to our city markets are sold for a higher price in proportion to the cost of production. This high price is owing in great measure to the difficulty of transporting them over long distances without breakage and decay. The old method of packing in oats does not satisfactorily prevent either of the sources of loss specified.

Breakage will result more or less in spite of the greatest care in packing, and the oats are liable to heat from dampness or other causes, and in this state eggs are very liable to spoil.

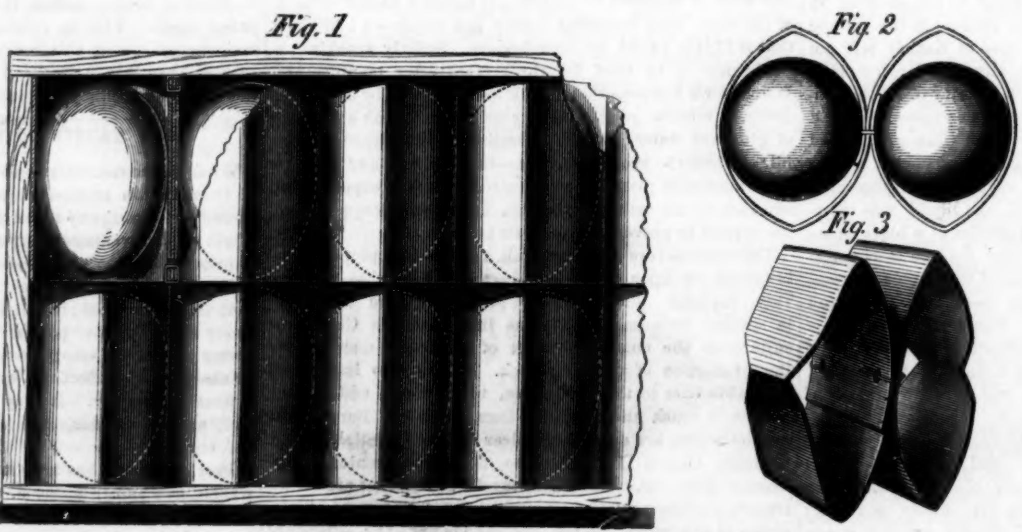
It has, hence, been deemed very desirable to devise improved methods of packing in which the faults of the old method do not exist, and various inventions have been introduced with considerable success for the purpose.

The invention we herewith illustrate consists chiefly in the form and construction of the pockets, designed to hold each egg entirely free from any contact with its fellows, and also to provide a free circulation of air, whereby the package may be kept cool.

The form of the pockets is shown in Figs. 2 and 3. They are made of bark, straw-board, or any other very cheap material possessing the requisite stiffness. The walls are cut out by a stamper to the proper shape, and fastened either by a wire loop, as shown, or by eyelets, which can be done with great rapidity by the use of an eyelet machine. When fastened together the walls of the pockets inclose ellipsoid spaces in which the eggs are placed, as shown in Fig 2.

The pockets, with the eggs, are placed on shelves in the general package, as shown in Fig. 1, each layer being separated from the others by the intervening shelves. The form of the pockets is such that free ventilation is secured, while it would seem almost impossible that breakage should occur through any amount of rude and careless handling. The device has, moreover, the very great merit that it is exceedingly cheap. The device is well worthy the attention of manufacturers and dealers in agricultural implements, etc.

Patented through the Scientific American Patent Agency, November 23, 1869, by Austin S. Smith, No. 55 Tremont street, Lawrence, Mass., who may be addressed for the entire right, or who may be negotiated with for the privilege to manufacture on royalty by responsible parties.



SMITH'S DEVICE FOR PACKING EGGS.

On Glycerin Lotion.

Having what I consider a most excellent recipe for such a preparation, I here offer it for the benefit of those who wish to make such a preparation and have not already a better formula:

Glycerin, 3 fluid ounces; mucilage quince seeds, U.S.D., 10 fluid drams; pulverized cochineal, 5 grains; hot water, 1½ fluid ounce; deodorized alcohol, 2¼ fluid ounces; oil rose, 8 drops; pulverized gum-arabic, ½ dram; water, 8 fluid ounces.

Rub the powdered cochineal first with the hot water gradually added, and then add the alcohol. Then triturate the oil of rose well with the powdered gum-arabic, and gradually add the water as in making emulsion. With this mix well the solution first formed and filter, and to the filtered liquid add the glycerin and mucilage of quince seeds, and shake well. The mucilage of quince seeds should always be freshly made. If the alcohol is sweet and free from foreign odor, and the glycerin perfectly inodorous, a less quantity of oil of rose may suffice.

If care is taken in its manufacture, this will form a beautiful and elegant preparation, with a rich rosy fragrance.

When applied to the skin it imparts an agreeably soft, smooth, and velvety feel. It is an excellent application for the face after shaving.

I have tried many similar combinations but have never sold an article that has been so generally admired and so universally popular as this.—*J. B. Moore, in the Journal of Pharmacy.*

On Mounting Fish.

Mr. C. A. Walker gives some suggestions on the method of skinning and mounting fish in the "American Naturalist," which some of our readers may find useful. He says this class of animals possesses many beauties which, when removed from their native element, vanish forever, and it is in vain for the taxidermist to try to imitate those iridescent tints which characterize the living specimens. The best he can do is to preserve in form and general outline those characteristics by which he may be able to recognize his subject. Before proceeding to describe the operation of skinning, it may be well to state that the scales, as well as their color, may be preserved to a certain degree by applying tissue paper to them, which, from the natural glutinous matter which covers the scales, will adhere firmly; this being allowed to remain until the skin has dried, may be easily removed by moistening with a damp cloth. All small fish should be mounted in section, while the larger varieties may be preserved entire. Suppose the fish to be of such a size as to be mounted in section, first, it is necessary that it be as fresh as possible, as the scales will become detached if decay be allowed to commence. Lay the fish on one side, and cover the side uppermost with tissue paper, as stated above; also extend the fins by means of the same, and allow them to remain a a few moments until they become fixed and dry; this will be a protection to the fins and scales during the process of skinning. Having provided yourself with a damp cloth, spread it smoothly upon the table, and place the fish upon it with the papered side down. With the dissecting scissors cut the skin along a line following the contour of the body, but a little below the extreme dorsal edge, and a little above the ventral one, and remove the skin included within this line. The remaining skin must now be detached from the flesh, beginning at the head and separating it downward toward the tail. The spine must be severed close to the head, and also at the tail, and the entire body removed.

All the flesh having been taken from the skin, and the eyes removed, the inside must be wiped out and the preservative applied. It is necessary here to repeat the caution not to use any unnecessary strain that will be liable to distend the skin.

The skin should now be filled with cotton or tow, and this must be laid so evenly that there shall be no prominences upon the outside of the same. When filled it should be laid with the open side down, upon a board of proper dimensions previously prepared, and fastened to it by means of small tacks commencing at the head and fastening the edges downward toward the tail. It should then be set aside in the air to dry, care being taken not to expose it to the rays of the sun. When dry the paper which covers the exposed side, and with which the rays are distended, may be removed in the manner previously stated, and the glass eyes inserted with a little putty. As the glass eyes used by taxidermists are generally too spherical, and polished, it is well to manufacture them of wood, using common paint to restore the color, avoiding the use of varnish. Finally, the skin should receive a coat of thin colorless varnish, after which it is ready for the cabinet. In sharks and large fishes an incision should be made below the head at its base, along the ridge of the back, following either side of the dorsal fin down to the tail. The skin can then be separated on each side, and by severing the vertebræ at the head and tail, the entire body may be removed.

The tail having been skinned, the head should be pushed inward and the skin passed over it, when all the cartilage can be freely cut away. In stuffing these large species it becomes necessary to use a body support, and a bar of light wood may be used for this purpose; this should enter the skull, thereby being more easily kept in position, and extend to the base of the tail. Hooks can be fastened to this bar, and by means of wire the specimen can be suspended from above. The body should then be stuffed with hay, and the incision upon the back carefully sewed up. If the first coa

of varnish is observed to rise in scales, it should be removed with a solution of nitric acid and water, and the skin allowed to dry, when a second application of varnish will ever afterwards remain quite solid.

We may state in conclusion that with the exception of large turtles, alligators, and their allies, large sharks and a few other fishes of great size, stuffed specimens of the two classes of reptiles and fishes are very unsatisfactory to the naturalist, and that whenever it is practicable to preserve the specimen in alcohol, that method should be adopted in place of skinning and stuffing.

The Voyage of the Floating Dock to Bermuda.

An interesting account of this voyage has been written by "One of those on Board," from which we find that, contrary to the forebodings of many nautical men, this gigantic structure arrived perfectly safe, and apparently without any difficulty.

It will be remembered that she was finished in May, 1869, at a cost of close upon $1,250,000. She was fitted with a gigantic rudder, and two light wooden bridges were thrown across her for purposes of navigation; lighthouses, semaphores for signaling to her consorts by day, and flashing lanterns for night work were supplied to her; she was also provided with steam whistles and guns in case of fog, and at each corner was fixed a lightning conductor.

Her crew consisted of 82 hands, under a staff commander and other officers, and were quartered in several of the upper water-tight compartments, which were fitted as cabins, etc. As these had no ports, their ventilation was only such as the hatchways afforded, and in hot weather the "'tween decks" of the dock were almost unbearable. Her high sides were decked with wood, and afforded fair walking room, but by descending 53 feet of ladders her floor could be reached, and its clear space of 110 yards in length was a famous exercise ground.

The *Bermuda* was sent to sea without her caissons, which weigh about 400 tuns. These, having been made and fitted in England, were conveyed in pieces to Bermuda, and there riveted together by a body of workmen sent out for that purpose by the contractor. Even without them the dock weighed 8,200 tuns, and although when the wind was fair a sort of sail or curtain was set between her sides, neither this nor her ponderous rudder was found to be of much assistance. She had to trust entirely, both for towing and steering, to the engines of the men-of-war appointed to convey her to her destination. The vessels selected carried, perhaps, the most powerful machinery afloat, and, by the skillful application of competent strength, the *Bermuda* was moved through the water at an average speed of about five knots an hour.

On the 23d of June last she slipped her moorings in the Medway, and, being taken in tow by six tugs, proceeded to the rendezvous at the Nore, where the iron-clads *Northumberland* and *Agincourt* were in waiting to pick her up. The *Terrible*, whose paddlewheels have been doing good service for the last 25 years, steamed astern and in tow of the dock, for the double purpose of steering and of acting as a check upon her should she prove unruly.

The work of attaching the dock to the *Northumberland* was quickly accomplished. She was brought under the iron-clad's stern; the immense hawsers, 620 feet in length and 26 inches in circumference, were at once passed between the vessels, and the squadron started down the Channel. These hawsers were secured to the riding-bits in the cut-water deck, with which the dock had been fitted, and which formed part of the original design for rendering her navigable. This deck projected 24 feet, and was sloped away on the under side, so as to offer the least possible resistance to her progress; the after end of the dock was rounded off in a similar manner. The squadron made its way slowly down the Channel, the *Agincourt* and *Northumberland*, harnessed in tandem fashion, in front of the *Bermuda*, and the *Terrible* partly steaming and partly towing astern to keep the huge mass from yawing. The *Buzzard* and *Medusa*, soon afterwards relieved by the *Helicon* and *Lapwing*, took up their positions on either side, acting as a sort of police to warn off any vessels that might approach dangerously near to this strange ocean procession. The decks of her high sides were at about the elevation of the mizentop of the *Agincourt*, and outside the house which served as the captain's cabin was a regular flower garden, in which sweet peas, mignonette, and other common flowers flourished, giving to the place, as the writer of the journal observes, more the appearance of an Australian shanty in the bush than of anything appertaining to shipboard.

The hydrographer to the Admiralty had laid down a track, which was carefully adhered to by the squadron; it was based, as was the date of sailing, on the most careful consideration of probable wind and weather, and the result showed how soundly statistical knowledge of this sort may be applied. During the whole of her voyage, which lasted 36 days, nothing but the finest weather was met with; good luck, as well as good management, contributed to a prosperous conclusion, and the *Bermuda* was towed into Grassy Bay, off Ireland Island, on Thursday, the 29th of July, and rode at anchor opposite the camber in which her life is to be passed.

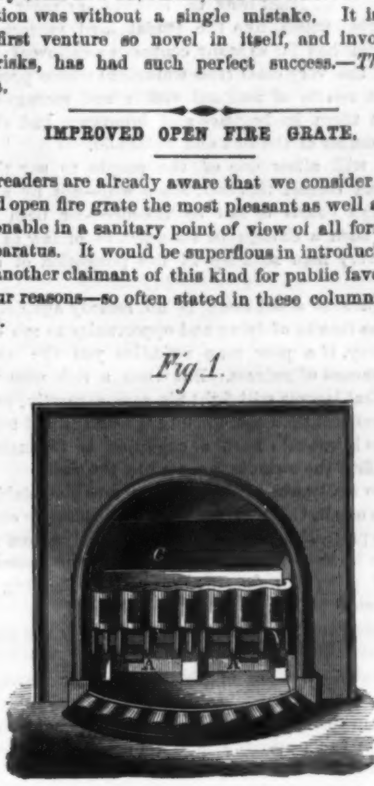
Since leaving the Medway there had been no accident to life or limb, although the clearing of the tackle, etc., often involved very dangerous service. The vessels towing her had been managed with a skill and delicacy only appreciable by those who know how much may depend in the crisis of an undertaking of this sort upon a few strokes of the wheel or turns of the screw. The careful selection and special qualifications of the officers are evident from the fact that in passing through the "Narrows" of Bermuda the dock was committed to the charge of two gunboats stationed at the island which were so badly handled that perhaps the whole undertaking would have been frustrated by some catastrophe had not some officers from the *Warrior* been sent to take command of them, after which they worked perfectly. The last few miles were the most anxious of the whole voyage, and the currents of the "Narrows," the tortuous and shallow channels involved great risk; the iron-clads drew too much water to be used here, and the *Bermuda* evinced at one time a disposition to start on her own account for Halifax, taking the *Terrible*, which was doing her best to persuade the dock to face the "Narrows" in tow. However, after a day's expenditure of tackle as has rarely been equaled in naval annals, the monster was coaxed into submission, and passed into the harbor all safe.

The only place touched at in the voyage was Porto Santo, in the Madeira group, when the *Agincourt* and *Northumberland* gave place to the *Warrior* and *Black Prince*. The highest speed ever attained was 6½ knots; but this involved a great consumption of coal, the husbanding of which was one of the chief necessities of the expedition. The senior officer was most unremitting in the carful performance of his duty; day and night, all through the voyage, flags, semaphores, and lanterns were at work, and the signalmen of the squadron had little rest; every *contretemps* was foreseen, and defeated by some new expedient, and the whole conduct of the expedition was without a single mistake. It is not often that a first venture so novel in itself, and involving such great risks, has had such perfect success.—*The* (London) *Artizan*.

IMPROVED OPEN FIRE GRATE.

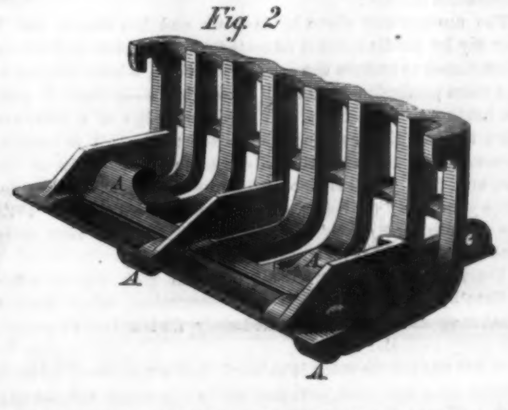
Our readers are already aware that we consider a well-constructed open fire grate the most pleasant as well as the least objectionable in a sanitary point of view of all forms of heating apparatus. It would be superflous in introducing to their notice another claimant of this kind for public favor, to dwell upon our reasons—so often stated in these columns—for that opinion.

Fig 1.



It is claimed that in this grate, called by the inventor the "Utility Fire Grate," better combustion is obtained than in any form of grate heretofore employed; as the draft or air passage is at both the ends and back. And while by this arrangement the air finds its way readily to all parts of the fuel, leaving no black spots or unburned portions, it secures the contact of the oxygen to the hottest part of the combustible and the best conditions for perfect combustion are thereby secured; while the released gases, instead of escaping through the chimney are burned. This, it is claimed, is secured without admitting so much air as to carry off and waste the heat generated, which is equally as wasteful as to have the gases unconsumed.

Fig 2



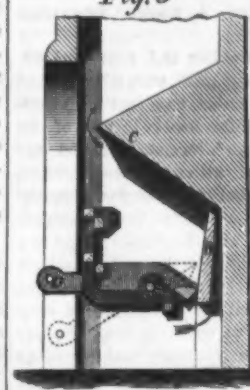
In this grate the back and ends are the hottest parts of the fire, as the movement of the shaking lever agitates and clears from ashes those portions, and leaves a free passage for the inflow of air. It is claimed that by this means even fine slack may be perfectly burned; and as all poking of the front of the fire is needless, the dust raised in shaking rises wholly through the chimney, without pouring forth into the room as with other grates; a most important advantage, as all good housekeepers will bear witness.

Fig. 1 is a front view of the form of grate as obtained by a change of old fire grates to secure the improved form, and mounted in the fire place.

Fig. 2 is a perspective view of the same removed from the fire place.

Fig. 3 is a sectional view of the fire place and the form of grate as made new. A brief description will give a full understanding of the parts and their respective uses.

Fig. 3



Lugs, A, to which the raking apparatus is pivoted, Figs. 1 and 2, are attached to any form of grate now in use, these lugs passing between the bars of the grate, and being held fast by pins driven through below the grate bars at right angles to them.

B is a back plate inclosing a flue through which air passes up to meet the hot and yet unconsumed gases, thereby supplying the necessary oxigen to perfectly consume them and mingling with them, as they are somewhat retarded in their flow over the bridge plate, C, Figs. 1 and 3. D, Figs. 2 and 3, is the socket for the lever employed to actuate the raker.

The principles upon which the grate is constructed are scientifically sound, and it has, we are informed, secured much popular favor where it has become introduced.

Patented by James Old, 175 Wood street, Pittsburgh, Pa. County and State rights may be applied for to his agent, Joseph Nicklin, of the same place, or to the patentee as above.

The Divining Rod.

The following remarks on the supposed use of the divining rod in mining were made by Mr. Warrington Smyth, in a recent lecture at the Royal School of Mines:

"It is stated by some writers, and believed in some districts, that the backs of lodes may be followed by particular plants or herbs growing on them. There is some foundation for this idea, but it must not be taken as of unlimited application. The lode is composed of materials different from the ground at its sides; and if softer it will be lower, and the water will naturally flow along it, making the herbage brighter and greener, and nourishing a certain class of plants which will not grow on the dryer and harder soil adjacent. Quartzose veinstone often contains iron pyrites, which is decomposed by exposure to air, and soon producing a somewhat higher temperature, so that snow will melt sooner, and rime and hoar frost will not lie so long upon the line of the lode, and so indicate its presence. In some places it will not require a very acute sense of smelling to detect the presence of a lode by the nose; and anyone who has visited such mining districts as those of Wicklow, which abounds in pyrites, will remember the peculiar odor which prevails. In some places sulphurous acid arising from the decomposed lodes may be distinctly tasted. It has also been affirmed, not only in this country and in Hungary, but in late times in the United States, that lodes have been discovered and traced out by means of luminous coruscations playing along them. You will find statements of this kind in Pryce's 'Mineralogia Cornubiensis,' on the authority of credible observers. The mine of Nagybanya, in Transylvania, which is rich in gold and tellurium, was, it is said, discovered by appearances of this sort. Another curious method of searching for lodes is that by means of the 'dowsing rod.' Those who are inquisitive on the subject will find interesting details respecting this system in a curious book published in 1826 by the Count de Tristram, and in 1854 an ingenious book was published on the same subject by M. Chevreuil, a member of the French Academy, 'On the Bagnette Divinatoire (as the French call it); its Use,' etc., which combated the objection raised to the divining rod as a pure deception, and ascribed its action to philosophic causes. The 'dowsing' or 'divining' rod is a forked stick of some fruit-bearing wood, generally hazel, held by the extremity of each prong of the fork in a peculiar way. The 'dowser' then walks over the country he is to try, and when he approaches a mineral deposit the thicker end or handle of the fork turns down in spite, it is said, of all the efforts of the holder to the contrary, and points to the lode. There is no doubt that, owing to the way in which it is held, it has, when once it begins to move, a mechanical tendency to turn. As a general fact, however, it may be taken that it has not led to the discovery of any valuable lodes, and I am inclined to agree with the old author, Agricola, who says 'That a miner ought not to use this enchanted rod, because I want him to be a man skillful in other means, learned in geology and mineralogy, and able to give a right judgment as to the locality of the lodes without resorting to this questionable art.' Although it seems unnecessary to discuss seriously anything so doubtful as this 'divining rod,' many eminent persons have believed in it. A very clever man, Mr. Cookworthy, of Plymouth, the first man to apply to useful purposes the china clay of Cornwall, was a great adept at the use of the 'divining rod,' and a French ecclesiastic in 1862 was making a handsome income by discovering springs of water by its aid. A case occurred in Cornwall last year, in which what is called the Chiverton lode was said to have been discovered by the 'divining rod.'"

Morgan's British Trade Journal states that a kind of wrapping paper is now made in England which contains iron filings incorporated in a peculiar manner, and which, weighing much more than more costly commodities in proportion to its bulk, is recommended by the manufacturers to the use of tea dealers, and the venders of such articles as are usually weighed in paper. Well, indeed; can we Yankees beat this?

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Small Turbine used to Drive a Large Flouring Mill.

MESSRS. EDITORS:—A very interesting and successful experiment in driving a large flouring mill, with a high head of water and a very small turbine wheel, has just been completed in this place. The Cascadilla Brook is one of the smaller streams that comes down the hills that surround our town, through a very beautiful glen, with numerous cascades, and hence its name. Near Cascadilla Place, a large and costly building connected with Cornell University, these cascades are high and the glen is very deep, and the whole gorge is a picturesque one to its lower end, where is the mill of which I have spoken. The last one hundred and twenty-five feet fall belongs to the mill. The capacity of the stream in very low water is only about ten or twelve cubic inches. In our high spring flood it often is a torrent violently rushing of as many or more cubic feet; indeed, in the words of an old lady, "Cascadilla is quite a cat when she gets her back up." But curbed with piles and plank, it, of late years, goes quite quietly through our town.

The problem of the mill was to make available this high head, at the minimum capacity of the stream, so as to drive at least two run of stone, in the lowest water, and at least four run in ordinary water, and the bolts and other machinery, which with fans, and cleaners of grain, elevators, etc., make quite a quantity and variety in a modern mill. The first indication was a pipe for the water. This was decided to be of iron, laid in a trench up the slope of the hill, just outside of the ravine. The second was a suitable wheel; and it was decided that if speed could be had, the whole mill could be driven by a very small wheel.

The matter ultimately took this shape. From a stone dam not quite a quarter of a mile off, a flume has for years run along the side of the gorge, to a spot a few hundred feet up the slope from the mill. Near about one hundred feet perpendicular hight above the wheel pit began the iron pipe and was laid down the slope 320 feet, to where it branched into two parts, one for the plaster mill that grinds the Cayuga plaster, that great fertilizer for our wheat lands; and the other to the flouring mill, some one hundred feet further on.

These branches were laid with sixteen-inch pipe. At the flouring mill the branch terminates in a large globular case some three feet in diameter and two feet high. In this is located first the water wheel gates, and just beneath them the, at first sight, insignificant little wheel, only *eleven and a half inches in diameter*. This wheel is supported on a two or two and a quarter inch steel shaft, which comes out of the top of the globular case by a water-tight packing; and on the top of the shaft is a belt pinion about a foot in diameter with a belt of the enormous width of sixteen inches, which belt passes about a wheel seven feet in diameter, and which wheel is connected by a cog pinion to the large common driver of the four run of stones of the mill. This gives the stone driver and its upright shaft about twenty-eight revolutions to the minute; while the puny water-wheel, in its little iron case, shall make the surprising number of *nine hundred* revolutions per minute. As they say of inheriting property, this is planning with "large expectations" of the wheel. But I can say that I have seen this actually accomplished. The wheel runs its nine hundred revolutions as quietly as if it had for years understood the business, and was not a novice in high speed; and as certainly and smoothly drives the four run of stone, and their bolts, and the other packing and cleaning machinery. So quietly does it do its work that we can hardly realize its full power; for turning flouring mill stones is no child's play, even for thirty and forty feet overshot wheels.

The vent of this wheel is in technical language fourteen and three-fourth inches; but it runs with ninety-five feet head of water, this whole mill and its four run of stone with the use of only two thirds of its ventage. The wheel is made of bell metal, as are the gates and other important parts.

Its existence is due mainly to the skill and energy of Howard C. Williams, Esq., who owns the mill, and has expended some five thousand dollars in this experiment. Thus is demonstrated the fact that great overshot wheels, enormous and costly machines, often in our eastern States costing as much for wheels alone as the pipe and all have cost in this, are matters of a by-gone age. And it is in the power of our wheelwrights to make useful many a small stream, that comes down a sloping hill, in such a manner as to make it impossible to construct these now useless large wheels. Further, it proves that any degree of speed on small wheels is attainable, and any number of feet of fall can be used on these excessively small wheels. For low heads, speed in the water cannot be had, and hence large wheels moving slowly must always be used; but in proportion as the head becomes high, motion rapidly can be had by its pressure, and the small wheel moving proportionally fast, can be belted down to the speed required in the arts of daily life.

It will be seen by the attentive wheelwright or mechanical engineer that the relative adjustment of this mill and wheel and its pipes can be improved. But the demonstrated value of this trial is of world-wide value. This mill has been driven day and night without hardly a stop. A hand wheel operating a screw, slowly opens its gates. A night cut-off, closes at pleasure the whole of the water from the wheel.

Ithaca, N. Y. S. J. PARKER, M. D.

Gravitation Not the Result of Magnetic Attraction.

MESSRS. EDITORS:—In your valuable paper of January 8th, your correspondent, W. T. Stewart, has tried to explain the rising of a cannon ball above the horizontal line by temporary suspension of the earth's attraction upon the atoms of revolving bodies; having found by his experiments, as he claims, that magnetic attraction is the true cause of gravitation, and that rapid reversion cuts off the magnetic currents, the cause of gravitation.

If this should be the case gravitation would be many times greater near the poles of the earth than near the equator, because the magnetic poles of the earth nearly accord with the rotation poles.

Iron is much more strongly attracted by magnetic poles than any other metal, and would be, in that case, the heaviest of all metals.

Some metals (the diamagnetic ones) are repulsed by any magnetic pole. Such metals could have no weight at all.

I request your correspondent to put his gyroscope in a good balance, and he will find that it does not lose the least part of its weight by being brought into rotation. By the gyroscope can only be proved that rapidly rotating bodies resist change in the direction of the axis of rotation, but not that they lose any part of their weight. HUGO BILGRAM.

Philadelphia, Pa.

Monopolies.

MESSRS. EDITORS:—In your article on the "Growth of Monopolies" in the number of January 8, you hold out but slender prospect of relief from the incubus so clearly pointed out—an incubus which, like the feudal land monopolies of the Old World has for so many centuries swallowed up the earnings of the very class (the workmen) whose prosperity is the surest source of national wealth and strength; and which keeps them in beggary and ignorance, and thereby limits the number of the rich and well-to-do.

But, you will allow one of the people to say that he thinks we can correct this evil, if we will—not by a direct attack through courts of law or violence—for both would fail—but by such a change in the practice of law as would insure to every man security in the possession of all his earnings.]

As we at present stand there is no remedy against those who have the faculty of lying and opportunity to rob others. In a small way, if a poor man swindles you the law soon furnishes a means of redress. But when a rich man robs a poor man what lawyer will fight his case earnestly, or what court do otherwise than countenance the delays and tricks by which a case is put into such a condition as to enable the court to confirm the swindle invented by the rich?

Now if we really want to have justice and give stability to the fortunes of all, there is no better way than by enabling the weak to protect themselves. The grand object of law ought to be to keep up a proper equilibrium between all classes, and prevent frauds by the poor on the rich, or the rich on the poor.

The "decline and fall of nations" is simply the result of a license to swindle each other—a "let alone," "let do" system—that false direction of the intellect and energies of men.

A change in the system of law practice does not imply the destruction of the profession of law, but a modification of it that will make it more popular than the present system, which is of class or feudal organization and practice.

Reading Bell's Law Dictionary (Scotch) I was struck with the fact that in certain cases a jury can be called together to examine evidence and return their verdict thereon, which verdict is attested by a judge and returned to chancery for proper action.

Let us extend this suggestion to a case of cornering railroad stock, and similar directors' swindles to rob shareholders of their little investments, and let us give to every man thus wronged "by his own acts" (into which he is entrapped) the power of calling together his own court, and obtaining without an hour's delay a verdict upon which he can pursue and punish in their persons all such swindlers; and would we not soon have better management, more general wealth, and fewer respectable rascals?

The answer now given by lawyers, and law courts, and I may say by public opinion educated to their interested views—interested to sustain the aristocratic class, which created it as a class profession to defend class rights—is that, if you, not having the foresight and foreknowledge of a God, act upon the positive evidence presented to you, all of which, however, is false and artificially made up especially to rob you, and find yourself deceived and wronged, that you "deserve your fate" for being so deceived and wronged! "We can do nothing for you," say the court; "we are very sorry for you, but there is no law to meet the case!"

Yet if a poor man "chisels" a rich man out of a few dollars by far less deceptive representation, what lawyer, what magistrate will not immediately find a law to punish the petty swindler?

What the people want is to work into a system of self-protection by a generous, just, and fair law practice and arbitration. We do not need to be governed by enormously-paid aristocratic officials, but we wanted to be protected at a cheap rate, and by immediate action, from all those selfish and crazy practices of individual power, which demoralizes the best and most capable of men. C. L. A.

Washington, D. C.

Aerial Navigation.

MESSRS. EDITORS:—I hear a good deal said and see a good deal written about aerial navigation. I don't believe in it. I'm not an old fogy, nothing of the sort; on the contrary, I believe that "some things can be done as well as others," as Sam Patch said when he jumped off the factory roof into the mill pond, but when he jumped off Genesee Falls, he found that to be one of the things he could not accomplish successfully.

I have been a close observer and reader of what has been going on these fifty years in the world of art, mechanics, and science, and therefore am very slow to say or even to think that there are any bounds to possibility in the mechanical world; but no doubt there are impossibilities, and among them I put perpetual motion, and aerial navigation against the wind.

Now let us see whether I am right? Here is the air ship, finished, let us assume, in the best possible manner, with every necessary condition fulfilled; sufficient buoyancy and sufficient motive power, with the lightest possible machinery, and with ability of the propellers, whatever they may be, to take sufficient hold of the air to drive the apparatus.

It is a condition absolutely necessary, to provide sufficient floatage for the machine, and this involves a very large float opposed to the action of the wind, blowing sometimes with tremendous force. Assume that the propelling power is sufficient to resist this, then what must happen? The machinery—the ship—keeping its place or advancing against the wind, and the float yielding to the tempest, as it must, in which case the float no longer acts as a support to the ship, for the whole concern will be for the moment nearly or quite horizontal, succeeded instantly by a violent oscillation.

Who has not observed this in the ordinary balloon in even a moderate gale, the wide swing of the car, and sometimes a violent pendulous motion, causing the green navigator to fear that he is to be thrown out of the basket.

Ships like to anchor in a gale if they can, and thus ride it out: a good thing to do, if they can get fast hold of a good bottom with sufficient ground tackle. Now imagine your air ship securely anchored, so that the hull, containing the machinery, will not yield to any stress of wind; what will happen to the immense float by which the hull is sustained? Let him answer who has seen a close reefed main top-sail, of the heaviest duck, blown out of the bolt-rope with a report like that of a six pounder. N. D.

Portland, Me.

Errors in Regard to Gravitation.

MESSRS. EDITORS:—Articles from correspondents in a recent number of your paper, in relation to cars jumping the track, rifle shots rising, boilers and grindstones bursting and flying up, tops spinning, and gyroscopes gyrating, "in defiance of gravity," bring us nearer than ever to the long sought flying machine.

All we have to do—according to these philosophers—is to put on the steam until the centrifugal force of the moving train overbalances gravity, when we could ignore the track, give the train an extra twist, reverse our polarity, and take a range high above mountain and forest. Coals would become superfluous, as the boiler would soon be hotter than Brick Pomeroy's paper and the passengers done brown.

These theories on false assumptions would be simply amusing were they not liable to mislead the novice.

Let us first ascertain whether the pail of water is really no heavier with two fishes in it, before attempting any explanation of the assumed fact.

The notion that shots rise after leaving the gun is probably much older than rifles.

There are weighty reasons why they should fall, but only one thin and airy argument in favor of their rising, and that is the difference in density of the air through which the upper and lower half of the shot is passing.

With balls some miles in diameter and great velocity, this might have some appreciable effect; but with any velocity and caliber we have yet attained with our biggest guns and longest range, the ball would probably be about the same through air as in a vacuum.

"Weight is the measure of gravity" and also an essential element of momentum. If by whirling a shot we detract from its weight we make it less harmful to the foe, and by increasing the "twist" artillery firing might resemble pelting the enemy with feathers.

"Change of polarity" is very ingenious, but gravity is too wary a bird to be caught with such chaff. A locomotive at high speed might leap a short break in the track by reason of its inertia as a mass, with which the revolution of the wheels has nothing to do. A sleigh would do the same thing. A skater, to pass a weak place, quits his gyrations and glides swiftly forward, bating his breath and fixing his muscles to prevent oscillation.

It is doubtless true that the wind sometimes assists to throw a train off, when it blows from the right quarter. It is, no doubt, quite as true that the wind often assists to keep the train on the track, as when passing round a curve with the wind on the outside.

The great prime causes of trains jumping the track are to be found in sharp curves, oscillating locomotives, and uneven road beds.

Tops and gyroscopes weigh just as much when rapidly revolving as when at rest; so do grindstones and car wheels.

Boilers generally fly up on exploding because they usually give way at the bottom.

Why detached portions of bodies revolving in a vertical plane take an upward angle, is a very nice question and worthy an able pen. B. F. WILSON.

Syracuse, N. Y.

Improved Upholstering Material Wanted.

MESSRS. EDITORS:—Permit a protest through your columns against the all but universal use in public conveyances, of that dirty and pestilential abomination, the plush or cloth cushion.

The King of Prussia who banished upholstery from his

apartments showed a stamp of genuine refinement, not visible on some railroad boards.

As yet, Western civilization (?) has devised nothing that, in a sanitary point of view, will bear comparison with the familiar cane seat of Oriental origin.

The inventor has here a fine opportunity to contrive a self-ventilating seat for the million, accessible at all parts for cleansing or repairs, and self-adaptable to the human form, however fearfully and wonderfully made.

Cincinnati, Ohio. C. H. KNIGHT.

For the Scientific American.

THE EGYPTIAN FELLAH.

BY I. CANTINI.

Since the beginning, progress, and final success of the works of the canal of Suez, the word "fellah" has often been introduced into writings and discussions of matters connected with this great work. It will not therefore be out of place to give a short description of the interesting and ancient people to whom this name applies.

"Fellah" is an Arabic word, and signifies "laborer of the soil." It distinguishes this class of Egyptians from the nomadic Bedouins. They are not to be confounded with the Foulahs, a largely scattered negro race of Soudan, nor with the Fellatahs, another negro tribe of western Africa. Long before the age when the dates of events began to be recorded, this patient, gentle, and ingenious race possessed a system of agriculture surpassing in perfection that of the present time. The tombs of antiquity speak of the life of this ancient race; and the type of the present generation is the same as that found in the mummies of their sepulchres. The fellah of to-day may see and meet with his own image amid the silent dwellers of the graves. Their blood must have been of a particular quality, that it so long retained its purity. This race has alternately been conquered by Ethiopians, Persians, Macedonians, Romans, and Turks, yet through all these invasions they have come forth unchanged; the type is unaltered.

The face of the fellah is oval, his skin dark. It is brown in the delta of the Nile, and becomes darker, even black in upper Egypt, yet his features are regular, the physiognomy noble, proud, and frank, and his manners more distinguished than would seem to correspond with his hitherto oppressed position. The fellahs are often misrepresented as being lazy, dirty, and wretched; the two first epithets are false, the last, alas! is but too true. They are poor, but their poverty is not a crime. They undergo fatigue and labor with great endurance and courage, and are all good Musselmen, and as such scrupulously observe the precepts of the Koran, which demands ablutions every day before each prayer.

Charity and hospitality are carried to a point which almost approaches the ridiculous, for they are too poor to do justice to these great virtues. The fellah works hard, and yet he possesses nothing, or if he does acquire riches, he is afraid to show or make use of them, for until of late years, the government snatched it from him as soon as it became known; and this has caused the fellah from time immemorial to hide his treasures, if such he had, by burying them in the ground.

The dwelling of the fellah is but a cube of earth, without roof or windows; the only furniture thereof is a mat, on which he sleeps, an earthen jar, wherein he fetches water from the Nile, and perhaps a few cooking utensils. His food consists of maize, sorgho, beans, and rice. The costume is a simple blue shirt or tunic to cover his body, and a felt hat to protect his head against the intensity of the Egyptian sun.

The men are in general kind to their wives, who share with them all the toils and hardships of life. The Koran authorizes polygamy amongst its followers, but this is a law which little affects the poor fellah, who contents himself with one wife. Children are everywhere considered a blessing, they cost so little to bring up and their hands are so much wanted in cultivating and irrigating the soil. The old habit of the Orient, sanctioned, though not invented by the great Mohammed, that the women should hide their face from public gaze is fast losing followers, especially among the poorest fellah women.

The degradation of the women is a greater curse to the East than tobacco or opium, yet there are certain limits; it does not extend to all classes of society. There are high grades of society to which it does not reach, nor does it descend to the humble laborious fellah woman.

The art of hygiene is much neglected in Egypt, and the nation is drained from its very source; they lose three out of five children on an average. Many parents among them had the courage to mutilate their own children, by putting out one of their eyes or cutting off a finger, so as to make them unfit for military duties, which were so much dreaded under Mohamet Ibrahim and Abbas Pacha. For the first time in 5,000 years the forced labor has been made easier; only one month and a half per annum are demanded by government to perform a duty which formerly occupied the greater part of the year, and left the fellah no time to cultivate his own land.

In Egypt, where it hardly rains, three times a year the ruler of the country causes irrigation of the fields by the distribution of the waters of the Nile. He can do this only by the help of men, and it is therefore in the interest of the people to serve their master. The patient fellah never bargains with the sweat of his brow for the demands of his sovereign, but he is not always so willing to serve a stranger and get nothing in return; his patience now and then gives out, and often an innocent foreigner is the victim of his anger. When the news of such an act of violence is received abroad, the public exclaims, "Behold the fanaticism of these infidels!" but this is a wrong interpretation; it is only misery which takes revenge.

There is hardly a country under the sun with such a healthy climate, such a generous stream and such an inexhaustible soil as Egypt, and yet these toilers of the land are the poorest of men. They are badly lodged, badly clad, and still worse nourished. From accounts given in Genesis, it is clearly shown that at that time, 1,700 years before the Christian era, despotism was the rule in Egypt. Moses says in his book that the kings were the owners of the lands, the nation, every individual with his goods and chattels, and that by a particular generosity he allowed the laborers one fourth of the harvest. This shows that not only has their type been the same for many centuries, but also their fate and their social position has been the same.

Nevertheless, they are, perhaps, without their equals as an agricultural people. The eye of the fellah is as sure and as straight in the laying out of his land as the instruments of a surveyor, and the defects in his agriculture have to be attributed to his poverty, and to the impossibility of working for his own advantage.

It would be wrong to believe the fellahs an inferior race, or devoid of intellect because their social position has always been an inferior one. Of late years, many have risen to high honors and functions. Among the most prominent in the present reign are Mazhar Pacha, Beghet Pacha, and Giraffer Pacha, Governor General of Soudan. This proves that even in Egypt, where the rich and the poor, the tax payer and the functionary are so distinctly separated, personal merit can overcome every obstacle to preferment.

A happier future is dawning to these poor fellahs under their present governor, Ismail Pacha, who but too plainly sees that the future prosperity of Egypt depends in a great measure upon its commerce and agriculture; he fully appreciates their worth and acknowledges their integrity by proudly calling himself "Prince of the Fellahs."

[For the Scientific American.]

THE BARRACOUTA.

BY JOHN RAMSAY GORDON.

The barracouta, or barracuda, a species of pike, is a fish which abounds in tropical seas. According to Webster, it is termed in Ichthyology, *Sphyræna Barracuda*. It is found principally in the waters surrounding the West India and Bahama groups of islands. In the Spanish colonies it has received the name, *Paricotas*, and in the French, *Becayune*. This fish varies in length from six inches to ten feet; it is very voracious, and has been known to devour its own species. Like the pike, it is long and narrow, is very swift in its movements, and can take its prey instantaneously. Its mouth is capacious and is provided with sharp teeth in both jaws. Though the barracouta is greedy it is very subtile, and will look two or three times at a bait before it will take it, but if it once lays hold it is sure to be captured, as it closes its mouth with such force that the hook enters it securely.

The manner of taking this fish is by trolling with a live bait—usually a small fish—and this is termed by the natives of the islands "towing for barracoutas." It is necessary that the boat used for this purpose should move very rapidly through the water and as noiselessly as possible. The line used must be strong, as the fish is very powerful, and the hook ought to be firmly attached to it by means of a long piece of wire about four feet in length. This is termed by the the natives "a tail wire." If the hook were fastened to the cord without the wire the fish would cut it away immediately.

The boat having been set in motion, no time transpires before a gentle tug is felt at the line, and upon the increase of its speed, the resistance of the ensnared fish is felt very strong. To prevent the line from breaking, more of it is run out slowly, until it is deemed necessary to pull the captive on board.

The barracouta, unlike most fish, can take its prey without turning on its side, as its superior jaw is shorter than the inferior, and, on this account, it is extremely dangerous to persons who happen to enter the water where it abounds; like other fish, did it turn on its side to seize the object of its desire, the scales would glitter and so give warning to its unwary victim. This voracious tyrant rarely goes to the bottom; its domain is in midwater, where it can capture the innocent fry which swarm the sea at certain periods of the year.

I have thought that it was unnecessary to describe the appearance of the barracouta, because it resembles exactly the pike, which is universally known.

The negroes are afraid to eat the flesh of the barracouta; they assert that it is not safe to use it as food, because it is poisonous at certain seasons, and the explanation they give of this peculiarity is, that it feeds at stated times in the vicinity of copper banks or veins running in the bottom of the sea. It is said, too, that sprats are poisonous at times, and the French writer, Pierre L'Abbat, who visited the West Indies, seems to have thought that this was wholly the cause of the barracouta possessing this deadly quality. He says that the sprats feed upon the mangenele-apple, which is exceedingly poisonous, and they are swallowed by this tyrant of the sea, thereby conveying the effects to those who partake of this fish. Now, it so happens that the mangenele bears its fruit at the very time when the fish is deemed poisonous; and, it is more likely that this is the cause than that copper veins should effect this change in the fish. Some persons, however, are regardless of fear, and, after having pickled the fish, they eat it indiscriminately.

I am not aware that the barracouta is in any way serviceable, and I believe it is captured more on account of the sport it affords than for any remuneration which it might render.

New Mode of Setting Boilers.

Several boilers in Sheffield, England, have been set upon a new plan. By a simple arrangement of fire-clay plates, says the Sheffield *Independent*, so managed as not to contract the capacity of the flue at any single point, the gases, after being thoroughly intermixed, are at four successive stages in their progress through the flue, thrown, in thin streams, against the surface of the boiler. No part of the gases can escape this repeated forcible contact with the boiler, and in the process the heat they contain is so thoroughly extracted and absorbed that the result obtained, as proved by careful tests, is the evaporation of nearly 12 pounds of water for every single pound of fuel, common boiler slack being used. This gives a large saving of fuel as compared with the best modes of setting previously in use. The patentees, we understand guarantee a saving of 25 per cent. The apparatus has the additional advantage of being an effective smoke consumer. The plan is applicable to any class of boiler; can be applied without unseating boilers already fixed; and the plates being of fire-clay, the cost is so moderate as to be very soon recouped by the saving of fuel.

New Method of Preparing Oxygen, by MM. St. Claire Deville & Debray.

New processes of manufacturing oxygen have lately been discovered by the two well known French chemists, St. Claire Deville and Debray. These gentlemen have observed that where sulphate of zinc is submitted to a red heat it is decomposed in oxide of zinc, so much used in painting; in pure oxygen, and in sulphurous acid—the latter gas being also much used in industry.

Also, sulphuric acid being submitted to a great heat will decompose itself in pure oxygen and sulphurous gas.

Also, by passing a constant small stream of sulphuric acid through a platina worm filled with platina moss, the sulphuric acid is decomposed; the oxygen gas is collected in a gasometer, and the sulphurous gas is passed through water containing carbonate of potassa or carbonate of soda in order to obtain a sulphite of potassa or soda, being also much used in the arts.

Disinfecting Fluid.

The Board of Health of the city of New York have recommended a disinfecting fluid composed of the following constituents: 1. Sesqui-chloride of iron. 2. Chloride of manganese. 3. Chlorine. 4. Carbolic acid. The sesqui-chloride of iron has been found by experiment to deodorize more effectually than chloride of lime, sulphate of zinc, or other disinfectant. It is therefore recommended as an important constituent of any disinfectant. Carbolic acid has a marked effect in preventing fermentation and putrefaction, and is particularly destructive to insects and lower forms of life. In consequence of improved methods of distillation of coal tar products, this substance can now be obtained in large quantities and at reasonable rates. A disinfecting fluid having a proper mixture of the above constituents would be a valuable article of commerce.

INTERESTING TO COLLEGES DESIRING MINERALOGICAL SPECIMENS.—The Nye Forwarding Co.,—we are informed by Professor Edward B. Coe, of Yale College—whose business it is to forward goods of all sorts to and from the territories, and especially to attend to shipments of ores and specimens from Colorado—has among its members a man interested in science, and acquainted with the value of minerals, fossils, etc., and who will see to their careful handling. The company will also forward free of charge to colleges, all specimens of fossils, etc., and will cheerfully answer all inquiries as to country, means of travel, prices, etc. Address Wm. McCord, Evans, Colorado.

SPONTANEOUS COMBUSTION OF THE HUMAN BODY.—Mr. A. B. Flowers, of Alexander, La., writes us that the statement made in a recent article on this subject, to the effect that no one has ever witnessed a case of spontaneous combustion in the human body, is a mistake, as he was himself, with several others, an eye witness to a case of the kind. The person who was the victim was a hard drinker, and was sitting by the fire surrounded by Christmas guests, when suddenly flames of a bluish tint gushed from his mouth and nostrils, and he was soon a corpse. The body, he states, remained extremely warm for a much longer period than usual.

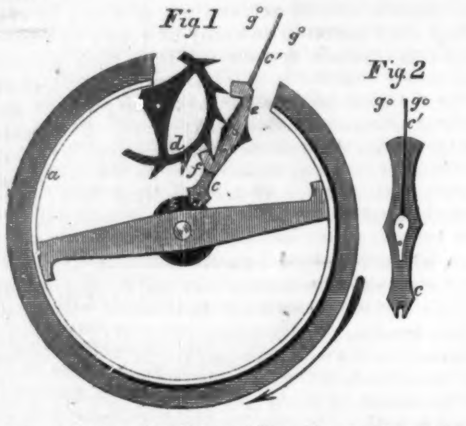
MANUFACTURE OF SAGO STARCH.—The wet starch is brushed through a sieve with one eighth inch holes, and falls into a cylinder which makes twenty-five revolutions per minute, by which the kernels are rounded, and from which they are removed on flat trays, and dried by steam. They are afterwards assorted by sieves to various sizes.

A GREAT PICTURE SALE.—Messrs. H. H. Leeds & Miner, auctioneers, of this city, will commence on the evening of February 4, at their art gallery, 817 and 819 Broadway, the sale of the most extensive and valuable collection of pictures ever offered in this country. The catalogue embraces over 1,700 pictures, ancient and modern, collected by the late Thomas Thompson, of Boston, who spent the best portion of his lifetime in gathering these art treasures.

TO TAKE STAINS OUT OF WHITE MARBLE.—Take 1 ox-gall, 1 wineglass of soap lees, ½ wineglassful of turpentine, mix and make into a paste with pipe clay. Put on the paste over the stain and let it remain for several days. If the stain is not fully removed a second application will generally prove sufficient.

IMPROVED LEVER ESCAPEMENT.

In watches and other timepieces acting with a balance wheel and lever escapement, it sometimes occurs that by a greater than ordinary impulse imparted to the balance wheel from any cause, the ruby pin after the lever has been moved over into the one position is carried sufficiently far round to cause it to strike the outside of the fork of the lever in the same direction, whereby, as the lever when thrown over is in contact with the one banking pin, and cannot,



therefore, yield to such striking of the ruby pin, it sometimes happens that the ruby pin is fractured or the balance wheel or pallet staff pivots broken or bent. Various contrivances have been proposed to obviate these inconveniences, but all have been either too complicated and consequently expensive in their construction, or too uncertain in their action for general adoption. An invention, however, recently patented in England, has for its object to provide both an efficient and simple means for preventing the above liabilities. The *Mechanics' Magazine* thus describes it.

"It consists in placing the banking pins at the tail of the lever, and in so forming this tail as to act as a spring instead of making it rigid as heretofore, the spring being sufficiently stiff as in coming in contact with the banking pins to limit the ordinary motion of the lever to the required extent, while it is sufficiently elastic to allow the lever to yield to the second blow of the ruby pin, and to assume its correct position after the ruby pin has passed it. In place of making the tail of the lever act as a spring, Mr. Cole sometimes fits a spring on to the pallet staff in addition to the ordinary lever, so that the spring shall act on the banking pins and yield to the second blow of the ruby pin.

"Our engraving shows a plan of the escapement of a watch with this invention applied to it: *a* is the balance wheel, with ruby pin, *b*, which works in the fork of the lever, *c*, in the usual manner; *d* is the escape wheel, and *e* are the pallets carried by the pallet staff, *f*, and secured to the lever, *c*. The tail of this lever is formed quite thin so as to act as a spring, and works between the banking pins, *g g*. If now the balance wheel, having received the impulse given by the action of a tooth of the escape wheel on one of the pallets communicated through the lever, should from any cause be moved so far round that the ruby pin, *b*, strikes against the outside of the fork of the lever, *c*, the tail of this lever resting at the time against the one banking pin will, through its spring action and the shape given to the forked end of the lever, allow the ruby pin, *b*, to pass by, when the spring tail will immediately cause the lever to regain its correct position for the ruby pin to act upon it in the contrary direction. The tail is, however, made sufficiently stiff to limit the ordinary motion of the lever by coming in contact with the banking pins."

OUR SPLENDID ENGRAVING.

The splendid engraving entitled "Men of Progress," engraved by John Sartain, of Philadelphia, at a cost of nearly $4,000 has received the unqualified praise of those who have been fortunate enough to secure a copy. There are nineteen figures on the plate, all good likenesses of the following eminent American inventors: Prof. Morse, Prof. Henry, Thomas Blanchard, Dr. Nott, Isaiah Jennings, Charles Goodyear, Joseph Saxton, Dr. W. T. G. Morton, Erastus Bigelow, Henry Burden, Capt. John Ericsson, Elias Howe, Jr., Col. Samuel Colt, Col. R. M. Hoe, Peter Cooper, Jordan L. Mott, C. H. McCormick, James Bogardus, and Frederick E. Sickles.

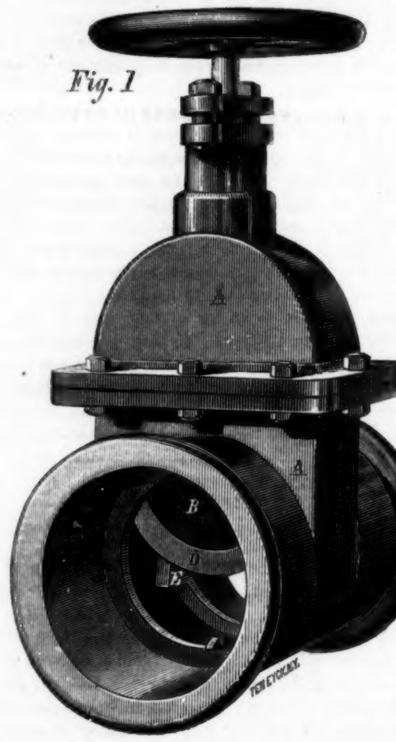
We continue to offer this beautiful work of art as a premium for clubs of subscribers, as follows, viz: Any one sending ten names and $30, will be entitled to receive for getting up the club one picture, delivered free; or if twenty names are sent with $50, one copy of the picture will be sent; thirty names with $75, two pictures. We are fully justified in urging our readers to possess themselves of this picture now while they have the opportunity.

Report of the American Railway Master Mechanics' Association.—By the courtesy of Mr. L. P. Dodge, Secretary of the American Railway Master Mechanic's Association, we are in receipt of the Second Annual Report of that Association. The report contains much of practical value and interest to railroad men and to mechanics in general, and we may hereafter extract some portions of it for the benefit of our readers. We are requested by the Secretary to say that any party entitled to this report who shall fail to receive it by the 15th of January, will be supplied on application to the office of the Secretary, No. 53, Dearborn street, Chicago, Ill., either personally, or by mail. Mr. Dodge will please accept our thanks for his favor.

LUDLOW'S SLIDING STOP VALVES FOR STEAM, WATER, AND GAS.

The most noteworthy and essential qualities of a stop valve may be briefly summarized. It should give a free and unobstructed flow to the liquid or gas, or in other words it should provide an opening as large as the caliber of the pipe, and in the direct line of flow. It should provide for the taking up of all wear upon the valve face and valve seat, as such wear occurs; so that it may keep constantly tight and free from leakage. It should not be liable to stick in its seat, however unfrequently employed. It should be readily and easily repaired, while at the same time it should be so durable that repairs are rarely needful. It should be easily worked under heavy pressure. Lastly, it should be simple in construction and cheap.

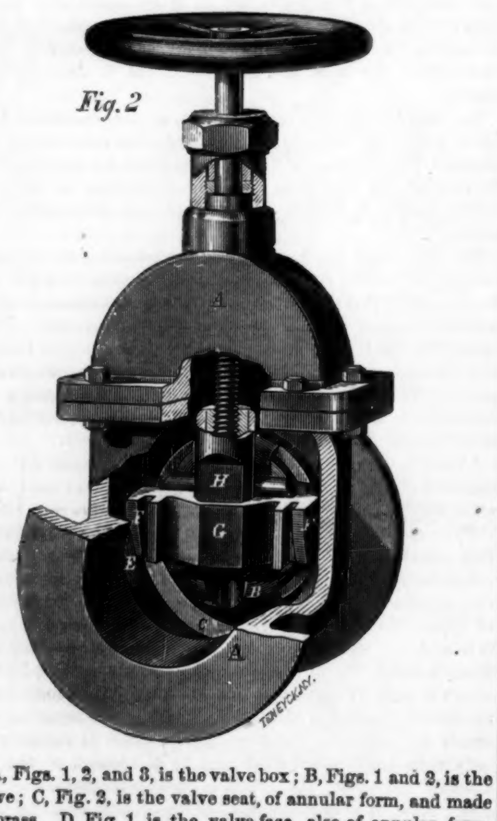
Fig. 1



The valve illustrated in the accompanying engravings, combines all these advantages with, so far as we can judge, no drawbacks of any kind.

Fig. 1 is a perspective view of the valve-box, and a partial view of the valve partly raised, with its face to the front. Fig. 2 is a view of the rear side of the valve; the valve box being partly broken away to distinctly show the arrangement and connection of the parts of the device. Fig. 3 is a view of the portion of the valve box at the back side of the valve. Such portions of the device as are shown in each of the engravings are indicated by the same letters on each.

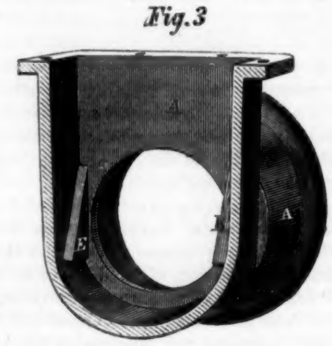
Fig. 2



A, Figs. 1, 2, and 3, is the valve box; B, Figs. 1 and 2, is the valve; C, Fig. 2, is the valve seat, of annular form, and made of brass. D, Fig. 1, is the valve-face, also of annular form, and of the same material as the seat. E, Figs. 1, 2, and 3, are inclines cast on the part of the valve box lying back of the valve, the uses of which will be subsequently described. G, Fig. 2, is a wedge-bar or plate, lying across the back of the valve, having inclines, F, cast thereon, which inclines rest against the inclines, E, of the valve box, A, when the valve is closed. H, Fig. 2, is an upright, or nut, rising from the wedge-bar, G, having a female screw formed in it to fit the screw stem.

When the valve is closed by the action of the screw, the wedge-bar, G, moves slightly, after the valve has fully covered its seat and port, and by the action of the inclines, E, and F, pressure is exerted on the back of the valve, holding it firmly to its seat; the combined power of the screw, inclined plane and wedge, being used for that purpose. In opening the valve the wedge-bar starts first, releasing the valve from pressure before it is moved. The inclines, E and F, are so abrupt that they do not stick, and their movement in opening the valve is easily accomplished.

Fig. 3



A double gate valve for large sizes used in water works, is also manufactured, the faces of the valves being turned from each other. The wedge-bar acts between these gates so as to close both simultaneously, and yet to open without friction. This arrangement provides for the absolute prevention of any leakage, as under enormous pressures, should a large gate be slightly sprung from its seat—the pressure being against its face—the opposite one would be all the more tightly closed, as it would receive the same pressure on its back.

Valves intended for steam are made of the best steam brass. The manufacturers will fill orders for all sizes of valves for steam, gas, and water, from one half an inch diameter to thirty-six inches diameter.

Some people having used valves purporting to be the genuine Ludlow valves, have been disappointed, the valves being merely imitations. These failures have been in some instances wrongly charged to the Ludlow valve, which is open to none of the objections raised against the imitations. The genuine valves have the name of the inventor cast on the side of the valve box.

The value of this valve is attested by a large number of gas engineers, hydraulic engineers, water commissioners, manufacturers, and superintendents of works, all of the highest standing and reputation. The manager of the celebrated Harmony Mills, at Cohoes, N. Y., states that they have been used in that establishment for water, gas, and steam, during two years, and that they have proved so satisfactory that henceforth no others will be used in those mills Many other similar testimonials from some of the largest works in America have been shown us, which leave no doubt that the valve is all that is claimed for it. For further information address Fred Stone & Co., 18 Dey street, N. Y.

Great Strike at La Creuzot.

The telegraph announces the strike of ten thousand operators employed at the immense coal and iron works at La Creuzot, in France.

Favored by the protection afforded to French industry, the business of the place has progressed, and at present the annual product is 250 000 tuns of coal, and 110,000 tuns of wrought iron. The works cover an area of 300 acres, of which more than 50 acres are buildings wherein mechanical operations are carried on. They have 15 blast furnaces of large dimensions, fed by 160 coke ovens, and using the blast of seven blowing machines of 1,350-horse power, and ten other engines for other purposes. The forge contains 150 puddling furnaces, 85 heating furnaces, 41 separate trains of rolls, 30 hammers, and 85 steam engines of 6,500 horse-power in the aggregate. This mill is all under one uniform roof, made of iron, and is about 1,400 feet in length, and is altogether in appearance and construction the most complete rolling mill in the world. Within the last few years the proprietors abandoned their old works and machinery, and in order to avail themselves of all improvements in machinery and process of manufacture, they erected an entirely new establishment. Forty-five miles of railway, 15 locomotives, and 500 cars, are required for the local operation of the works, and the enormous quantity of 1,400,000 tuns of traffic is annually moved at the central depot of La Creuzot.

The average wages paid for the whole ten thousand workmen was equal to 82 cents currency per day. These wages, so far below what are paid in the United States, explain and justify the discontent of the French workmen.

40,000.

It will be gratifying to the advertising patrons and friends of the Scientific American to learn that its present circulation is several thousand copies larger than at any previous time in its history. We are now printing a regular weekly edition of 40,000 copies, and subscriptions are flowing in from all sections of the country as they never came before. We confidently expect to run up our edition to 50,000 copies within a short time.

Since the opening of the new volume we have increased the number of contributors to our columns, and shall labor earnestly to give all the practical and popular scientific intelligence of the day.

Dr. Pidtmann, writing in *Virchow's Archiv.*, does not hesitate to assume that chronic poisoning by carbonic acid is comparatively frequent in his part of the country, which is rich in iron stoves.

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VOL. XXII., No. 5 . . . [NEW SERIES.] . . *Twenty-fifth Year.*

NEW YORK, SATURDAY, JANUARY 29, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

THE "SCIENTIFIC AMERICAN" IN 1869.

It will well repay our readers to turn back and examine the 826 pages of printed matter that we have furnished to them during the year 1869, and to study carefully the list of nearly 13,000 patents. No important invention or valuable discovery was permitted to pass unnoticed, and we have put into the hands of our subscribers ample material for the construction of a table of the wants of the community as expressed in a demand for a certain class of articles. The list of inventions preserved at the Patent Office in Washington is analogous to the meteorological record kept at the Smithsonian Intitution.

The one tells us of the fluctuations in trade and commerce, and the other indicates the change in wind and weather. We have long been in the habit of studying our barometers to see what the weather is likely to become, and no prudent mariner would venture out to sea without such an instrument to warn him of the approaching storm. Meteorology has been reduced to a science, and we have a monthly report upon all the questions relating to it, issued by the Department of Agriculture in Washington.

Few persons have reflected that a similar table could be prepared from our patent list. The record of inventions is the barometrical table of the value set upon certain contrivances by the people. No man in his senses offers a machine that does work for which there is no demand; but every one tries to produce something that exactly hits the wants of the times, and hence the patent record tells us what are the prevailing wants. The history of the manners and customs of a people could be written from the roll of patents. A time of war will show warlike implements, guns, cannon, shot, and shell; times of peace will give us mowers, reapers, and steam engines. It would be easy to see when war ended and peace was proclaimed, by scrutinizing the patent list.

We have made these observations for the sake of calling the attention of inventors to the importance of anticipating the future by a study of the past; and we shall illustrate our idea by pointing out some of the peculiarities of the present age, as indicated by the inventions recorded in our pages. During the early part of 1869 the velocipede was all the rage. No well-regulated household was considered complete without it, and sanguine people predicted that going on foot would soon become a matter of history; but the machine did not really meet a want, neither health nor comfort was promoted by it, and it disappeared as mysteriously as it came.

Solar heat as a motive power next claimed our attention, and before such a grand discovery every one felt disposed to bow his head. The precise apparatus by which this can be accomplished has not yet been invented, but we are on the threshold of the discovery, and there is a firm conviction in the minds of scientific men that the preliminary investigations necessary to the completion of the work will soon be ended, and we shall ultimately see the half-open door thrown wide open, and the invention become an accomplished fact. There is something real or substantial in an invention of this character, and it is well worth all the thought our ingenious mechanics and physicists can bestow upon it.

The fashions of our day demand brilliant colors, and the chemist has set to work to gratify this taste. We find one color after another added to our list, each vieing with the other in beauty of shade and permanency of tint, and the historian will wonder what use could have been made by the present generation of so much that could alone serve to adorn the outer man, not to say, the outer woman of the period.

The aniline industry, from small beginning has grown to vast proportions; and the records of patents show that the present generation is a prosperous one and able to procure whatever it desires for ornament and show.

That we require more books and read more newspapers than in past years, is evinced by the invention of new processes for the manufacture of paper and the supply of new stock to be employed in this industry. The demand for this class of inventions is proved by the number of patents for the use of wood fiber, corn stalks, straw, ramie, sea weed, and grass, to be very great, and this feature of our civilization may be taken as an offset to the more superficial love of display to be inferred from other inventions.

A higher state of society is evinced by the introduction of inventions looking to the amelioration of the condition of mankind. The talent of mechanics and the learning of men of science, are applied to the study of such questions as the earth closet—how to disinfect and economize all fecal matter so as to prevent cholera and fever, as well as to add to the fertility of the soil. The Norwegian cooking apparatus has been brought to greater perfection; and philanthropic men look forward to its introduction into the houses of the poor as a great improvement in the cooking and keeping hot of food, and also as being equally effective in storing ice for the sick room or for household use.

How to prepare cheap food has also played a prominent part in the investigations of the year, and distant countries have been laid under contribution for this purpose, while preservatives of all kinds have been invented.

The number of inventions and contrivances for elevating the condition of society, is greater now than at any former period, and inventors may well take note of this and shape their efforts accordingly.

We have discussed in our columns all of the methods devised to prevent the decay of wood. We have described how glass is manufactured, and how its optical properties have been more closely studied than formerly. The revelations of the microscope have shown us that life is almost everywhere —in the bottom of the ocean, in the water we drink and the air we breathe—and thus new subjects are brought out for study, and presently new inventions will be required for their application. The man of science points out the object, the man of practice shows us how to use it.

In architecture the improvements have been numerous and great. As our taste in this direction increases our wants multiply also, and each want involves some new invention which the ingenious man must be on hand to supply.

We have noted all that has indicated progress in agriculture—new implements and new comforts, and have pointed out what was needed to improve the condition of the farmer.

The importance of experiments in the cultivation of the sugar beet has not escaped notice, and the attention of inventors has been called to new evaporating pans, new purifiers, and new machinery for cutting and preparing the beet.

The progress of metallurgy and working of ores and metals, has received its due share of attention, and we have recorded all the improvements already made, as well as those that are anxiously sought after by men engaged in this branch of industry.

How to burn petroleum as a fuel has been the subject of profound study and experiment, and we have given all that is at present known on the subject.

The want of some cheap and economical method for the evolution of ozone has been explained, and the immense advantages that would accrue to the cloth and paper manufacturer, to the deodorizing of all substances, and to the bleaching of every material by this agent, have been fully developed by us in various articles.

We recall some articles on the subject of dialysis, and invite attention to the important application of which this principle of the diffusion of liquids is capable in the refinery of sugar, in the extraction of tan bark, and in other directions. We have watched the progress of electricity in medicine and the arts, and where an improvement has been made have hastened to record it. Still there is so much left to be done in this field that no one ought to despair of important discoveries. We want a practical thermo-electric battery, a better magneto-electric machine, and a constant electric light, and many improvements in the telegraph and in galvanic batteries.

How to make better gas for illuminating purposes has demanded new inventions, and yet the subject is by no means exhausted, and even at the present time the most approved methods of purification are not adopted in this country.

Not the least important portion of our paper is devoted to the answers to correspondents. It is said that "any fool can ask a question," but no one ought to be deterred by this from getting all the information he can. It is only a little knowledge that is dangerous, a good deal can always find a ready market. Hence the questions of our correspondents often elicit valuable information and point out the wants of a large number of people who have no other way of communicating with the public than this. It would reward the industrious reader to review the questions and answers of the year and compare them with the wants of a former period. The public pulse can be well felt through the beats of these inquiries.

We cannot give a summary of all that we have published during the year, as the number of topics is too great and our index can be consulted for that purpose; but we have endeavored to show that the best way to ascertain what the demands of a community are, is to study the inventions that are offered for their acceptance, and to ascertain what class of them find ready sale. After this information has been well digested, the inventor is in the condition to confine his efforts to the production of such improvements as are certain to meet with general approbation.

TIN—WHERE AND HOW IT IS OBTAINED.

Tin is one of the most valuable of metals, and its use, already widely extended, constantly increases. In a pure state it possesses no properties injurious to health, and hence it enters largely into the construction of culinary utensils. Its ores are not so widely and generally distributed as the ores of iron, copper, and lead, but in certain localities immense deposits of this beautiful metal are found.

One of the most celebrated of these localities is Cornwall, in England, where tin mines were worked before the invasion of the island by the Romans, and the mines of this district are the most important in the world. Tin ores of a very fine quality are also found on the Malay peninsula, Banca in Asia, and in Bohemia and Saxony in Europe. They also exist in Mexico and other localities in small quantities and of inferior quality.

Tin ores are found in veins, or in detached masses in alluvial soils, where they have been carried by the action of water. The latter ores are hence called "stream tin." The examination of the deposits of stream tin frequently leads to the discovery of the principal vein from which the broken masses of ore have drifted.

When the ores are got out of the mines they are sorted by hand to separate the purer portions from the inferior qualities. The inferior portions thus separated are crushed in a stamping mill and washed with water to remove earthy matters. It is next roasted in a reverberatory furnace to expel arsenic and sulphur which are nearly always found associated with tin ores. The heat in the roasting process expels these substances in the form of vapor, the arsenic almost wholly, and the sulphur partially. The remaining sulphur is mostly combined with copper in the form of a sulphate—blue vitrol. This is now removed by a leaching process which dissolves out the salt.

The iron which the ores contain having by these processes been converted into the peroxide of iron, is next removed by washing. The tin oxide being considerably heavier than the iron oxide, the latter is carried off by a stream too feeble to carry off the oxide of tin.

To get rid of the oxygen and the remains of silica still mixed with the ore is the next step. The washed ore being ready for reduction, it is mixed with from one fifth to one eighth of its weight of powdered anthracite or charcoal, the latter being by far the best, as it conveys no additional impurities to the tin. A small portion of lime is added as a flux and the whole is placed in the reducing furnace. The heat is slowly raised so that the oxygen of the ore combines with the carbon before the fusing point of the silica is reached. After five or six hours the heat is made very intense, and the silicious matters form a fluid slag which floats on the surface of the melted tin.

The latter is now drawn off and cast into ingots, which are however still too impure to be marketable.

The first step in the process of refining consists in what is termed "*liquation.*" This is performed by heating the ingots until the purer portions melt and run off, leaving behind an alloy which is remelted and forms an inferior quality "block tin." The purer portion being drawn off into a pan is kept in a gentle state of fusion for some time, and is stirred with sticks previously soaked in water. The steam generated from the water-soaked sticks escapes with considerable force and carries to the surface the dust slag and other impurities acting precisely like the air or water used in jigging machines, for separating ores from their gangues.

The finer portion of metal lies on the surface of the molten mass directly beneath the floating slag and this is often reheated to a temperature just below the point of fusion. Pure tin at this temperature becomes crystalline, and is easily broken into small fragments called "grain tin."

The purest commercial tin is the celebrated Banca tin, brought from the island of Banca which lies east of Sumatra. This tin is employed in the manufacture of the finest bells. It is almost chemically pure. English tin is more or less contaminated with arsenic, iron, and lead.

IS WATER NECESSARY TO MITIGATE THE EFFECTS OF DRY AIR FROM HEATING FURNACES?

The Boston *Journal of Chemistry* takes the negative of the above question? It maintains—what no one ever denied—that when air is heated it contains all the moisture it contained before heating, but it comes to a conclusion—which every scientific man will deny—that it is therefore absurd to suppose any addition of moisture is requisite.

As we have said, no one ever thought of denying that air loses none of its moisture by heating. The fact is, however, that when so heated its appetite for water is vastly increased, and not only its appetite is increased, but its capacity to seize upon and hold water is increased. In this state it sucks at every pore in the skin, robs the delicate membranes of the eyes and nostrils of their moisture, enters the lungs drying and irritating them, causes the lips to crack, and otherwise injures the animal economy.

If its appetite is appeased from other sources, it does no mischief, and this can best be done by putting a trough in its path at which it can drink its fill before it enters the apartment.

That air, heated, has its capacity for moisture increased, has long been a demonstrated fact, and calls for no additional proof at this time. But it finds a proof in a well known fact, which we only bring forward to show another kind of mischief resulting from not satisfying the demand for moisture, and to obviate which, were no other reason tenable, particular attention to supplying water to heating-furnaces is demanded. We allude to the effect produced by dry hot air upon furniture, and the joiner work in buildings.

Carpenters and cabinet-makers will affirm that wood of all kinds shrinks very much more under the circumstances mentioned, than where the air supplied to rooms attains a proper hygrometric condition before it enters them. And the most superficial observer can scarcely fail to be convinced of the truth of this statement if situated to observe and contrast the effects of moist and dry air upon wooden articles. We have seen these effects upon the panels of doors, almost ready to drop out, and upon furniture the glued joints of which were torn asunder by undue and unequal shrinkage caused by the breath of the fiery simooms from the registers, which too often convert parlors into ovens which kiln-dry not only every inanimate object containing any moisture, but also the dwellers in these health-blighting inclosures.

It costs some trouble to prevent these evil results by keeping an ample supply of water in the furnaces, but it will cost more trouble not to do it.

Any one who has attempted to cultivate house-plants in a room warmed by heated air has noticed how quickly they droop and languish when the water is out of the heater, and there are not a few people who are so sensitive to the effects of what is generally termed "dry heat," that they can determine almost immediately, by their uncomfortable sensations, when the water supply has failed.

We trust the article referred to will not have the effect to render any one who uses a hot-air furnace neglectful to keep the water reservoir constantly supplied. This subject has received the most careful attention from scientific men, and it has been long generally admitted that without proper attention to this important particular, hot-air furnaces are capable of doing great mischief.

WANTED--BETTER SIDEWALKS.

The question of improved sidewalks is collateral to that of improved pavements. There are serious defects in the sidewalks now generally used. We sum up the case against them as follows; premising that our charge is against bricks and flags, which constitute for the most part the materials of our present sidewalks.

First. They will not stay where they are put. They become rough and uneven, and both tender toes and high heels are made to suffer by collision against the insignificant preci pices which threaten the soles of all foot passengers.

Second. They are liable to get slippery and dangerous upon the slightest provocation of rain and frost. They are then simply inclined planes of ice, down which people slide incontinently, in peril of life and limb. A learned surgeon once remarked in our presence that injuries to the hip joint received by falls upon slippery pavements, were a fruitful cause of that painful and dangerous affection known as "hip disease," and it is quite probable that more wrists are broken in this way than in any other.

Third. Bricks, when employed for pavements are, unless of the best quality, apt to crumble under the action of frost and water, and become a first class nuisance. And even when they do not crumble, they absorb water and remain damp longer than is agreeable. Water getting beneath them and freezing upheaves them even worse than flags.

The ideal of a sidewalk is one that presents a continuous even surface not smooth and glassy, and not liable to get slippery except from a considerable accumulation of ice; impermeable to water, and somewhat elastic to the tread.

The only walks we have seen at all answering to these conditions are concrete walks similar to those in the Central Park of this city, and Prospect Park in Brooklyn. And we see no reason why these beautiful paths should not replace flags and bricks in all the streets of our American cities used for residences. For business streets the heavy flags now employed are perhaps, preferable, on account of the battering they can withstand, and which they receive from the unloading of heavy packages, etc., but for our quiet up-town streets, nothing could be, in our opinion, superior to the concrete.

A PECULIAR FEATURE OF AGRICULTURAL INVENTION.

The progress of improvement in agricultural machinery has been very gradual. People not very old can recollect when the ground was plowed with the cumbrous and imperfect wooden plow; when seed was sown entirely by hand, and harrowed under by the old V-drag; when crops were reaped by the hand sickle, raked by the hand rake, thrashed with flails, and winnowed with a willow fan.

Now all this is changed. Machinery has taken the place of hand labor in all departments of farm work; but in the gradual adoption of such machinery a striking peculiarity may be observed. It might resonably be thought, that one of the first things to engage the attention of inventors, in their attempts to devise machinery for farm work, would be the first operation in the cultivation of land--plowing; and that the natural law of progress would be from this fundamental operation to the final operations of thrashing and winnowing. But the history of agricultural invention shows that precisely the reverse has been the case. Such progress as has been made, has been from winnowing to plowing.

The first inventions in farm machinery we can find were machines for winnowing wheat and clover seed. Two patents were taken out in 1776 for machines of this kind. The details of these machines have so far as we know, passed into oblivion; but a long line of honorable successors has gradually brought us the improved fanning mills of the present day; and the march of improvement has at last wedded the fanning mill to the thrasher, and even a polygamous union of raker, thrasher, and fanning mill is now extensively adopted. Nay, even the harvester, one of the latest of agricultural inventions, is now joined to thrasher, raker, and winnower, so that the grain is delivered from the field in a single operation cleaned and bagged for market.

The next steps were the invention of the modern scythe, the cradle, and the horse rake. All these have undergone great improvements since their primitive forms were introduced. Only one of these, however, the horse rake, retains its supremacy, and there are strong indications that this will ere long be wedded to some sort of apparatus for loading, sufficiently practical to secure general adoption.

The next in the regular succession of machines for the farm (properly so called) after the fanning mill was the thrashing machine. This has passed through a long probation of trial and improvement, gaining in efficiency, and being combined with other devices, until little is left to be desired.

Following the thrasher came the machine cultivators, still in process of development, for the dressing and weeding of growing crops. Then inventors turned their attention to seeders and planters, and lastly, to machine plows, of which the coming steam plow is to be the crowning act of agricultural invention.

In looking over this field and tracing the progress of invention in it, we are forced to recognize that most prominent tendency of the age, the removal of the great burden of manual toil from the human race. The majority of producers must ever be found in the noble and manly occupation of agriculture, and yet the time must come when this shall not only be the most elevated of all the departments of labor, but it will also become the least exacting. There is plenty of room for improvement yet in machines already invented, but the most immediate and pressing want is a good, yet not too costly steam plow.

THE STEAM ENGINE TRIALS AT THE AMERICAN INSTITUTE EXHIBITION.

The Superintendent's report of the steam engine trials at the American Institute Exhibition has at last been made public in what is termed the "final report" of the judges. The facts have been kept back so long that it may be necessary for us to remind our readers that the experiments were conducted for the judges by Mr. Charles E. Emery, an experienced engineer, then acting as General Superintendent of the Exhibition, and who was formerly connected with the Government experiments at the Novelty Iron Works, and who wrote for our columns a series of articles on testing steam engines. Mr. Emery states that his report contains not only the facts in the case but certain "explanations and calculations embodied by direction of the judges." To his report, therefore, we must look for an explanation of the stultifying and ridiculous decision regarding the engines, to which we have already given place in our columns.

We have examined the report carefully, and see no reason why we should modify the opinions we have heretofore expressed on this subject. As regards the two larger engines, either one or the other was the better, and the judges should have been decided enough to say which; then, if they wanted to make an explanation that the result was due to improper workmanship or attention, they could have done so consistently.

The experiments appear to have been in most respects carefully and fairly conducted. The exhibitors had an opportunity to take their own records, and while this made it impossible to tamper with the facts, it still left as much opportunity as in any case for dispute in regard to the way the facts should be presented and weighed by the judges.

The amount of coal consumed has not been considered in making the award, and had the water evaporation been accurately determined, it would not have been important to consider it otherwise than as a confirmation of the water measurement. The estimation of the coal consumption would have been liable to some error arising from differences in the state of the fire at the beginning and close of each experiment, while the water evaporation might have been obtained beyond dispute. It was necessary to estimate the quantity of coal on forty-five feet of grate at both the beginning and close of an eight hours' trial, but as this was done with great care by all the parties interested, and the coal was leveled off to a line of bricks previously agreed upon, the error could not have been large, and such a basis of computation was not much improved upon by the use of a meter to measure the feed water used. This meter did not, when tested, give the same measurement at different speeds, but from the fact that both engines used very nearly the same quantity of water in the same time it is claimed that at the equal rates of speed actually employed during the experiments, the measurements were practically accurate. This may possibly be true, but it is not known to be true. In the papers previously published by Mr. Emery on this subject he recommended the use of tanks for measuring the feed water. He explains that tanks were not used in this case for the reason that the necessary valves might be tampered with. Better erect a separate building for the tanks, and guard it by a cordon of policemen, than have any such question arise.

The boiler used it appears could not be depended upon to furnish dry steam uniformly. It may have been the best that was available at the time, but its use detracts much from the value of the experiments.

The want of time appears to have been the great drawback in conducting these trials. If similar tests be again attempted, they should be commenced earlier, and published as soon as completed, and before the public had lost all interest in them.

We extract from Mr. Emery's report such portions as will be of greatest value to our readers, and publish them in another column. Our readers will see that the calculations are reliable only on the assumption that the water was correctly measured, an assumption which we regard as so doubtful that, in our opinion, the coal consumption is by far the better basis for calculation. This coal consumption, as ascertained by the weighing during the trial, is given in the report as unreliable, and it is estimated from the water evaporation, on the *assumed* basis of 9 lbs. of water evaporated to each pound of coal burnt.

ANCIENT MODES OF EXTINGUISHING FIRES.

Fire, which was anciently considered the most mysterious and terrible of the four "elements," and for that reason was the invariable accompaniment of the process of sorcery, divination, and magic, modern chemistry has shown to be no element at all, but simply the visible effect of rapid combustion; thus, indeed, it has lost its suppositious mystery, although its real capacity of producing terror must ever remain. There is hardly a scene which the mind can present to itself more heart-rending than that of a great conflagration—a city in flames and its inhabitants driven houseless and homeless into the bleak and icy air of winter; and this, too, by the very agent which they had used to further their comfort. Like all things, enough of which is good, but of which too much is disastrous, fire is a "good servant but a bad master."

We moderns, who have the telegraph to let us know in a moment in what part of a city there is a fire, and steam fire engines to appear at the scene of conflagration with a celerity which, a few years ago, was unknown even to us, can hardly conceive the terror which the outburst of a fire in a great city of antiquity caused in the minds of its inhabitants; especially frightful must such calamity have been in time of war, when, to be driven from a beleagured city was to be driven into the midst of cruel and implacable enemies, and it is well known that fire was one of the most common and destructive means employed in ancient warfare.

Antiquity, being thus put at its wit's end, devised means of extinguishing fires which must seem to us extremely ludicrous. The first hose used was probably the gut of an ox, having at one extremity a bag filled with water, which, upon being compressed, would eject the fluid in a stream; but such a contrivance would be of but little value when a city was on fire. At best it could send a stream but a short distance and the bag would need to be detached from the hose and replenished very frequently. The houses were not seldom quite lofty, and, altogether, this primitive hose must have been very unserviceable.

Buckets and syringes were used, as were also pumps, and doubtless other machinery of which history makes but little mention. At Rome there were professional firemen trained to their duties from youth, and known as *matricularii*. They appear to have been a boisterous set of men, not altogether unlike those who, a few years ago, were led to fights and fires in New York by the celebrated "Mose." The Emperor Trajan, writing to Pliny the Younger, who was Governor of Bithynia, and had asked instructions from headquarters in regard to raising a company of professional "fire laddies," said that they were not the most peaceable citizens possible, and that "they would not fail to form themselves into factious assemblies" on the slightest provocation. Just think for a moment what must have been the result of the meeting of the rival companies of *matricularii*! We all know what good service was done by "Mose" upon the devoted head of "Syksey" when the speaking trumpet was the weapon of offense—but how ridiculous as well as bloody must have been the fights of firemen in the narrow streets of Rome, when buckets, syringes, long poles with sponges attached to them, and stones, were the munitions of war. A party running down to the "yellow Tiber" to get water for the syringes, meet another party just returning with buckets, which they have filled with the precious fluid, intending it to be used by the mop-carriers. Instantly there occurs a row, upon the issue of which depends the possession of the buckets; the moppers and the bucketers run from all quarters to mingle in the affray, and, by the time that forty or fifty ringleaders have bitten the dust, the water is all spilled and the *casus belli* removed with a vengeance. In the meantime the conflagration is spreading, and it is lucky for Rome if, before long, a whole quarter be not burned down. That this is not merely a fancy sketch, may be seen from the accounts which have come down to us, showing that the rabble of Rome was the most quarrelsome and seditious of any in the ancient world with, perhaps, the single exception of the rabble of Alexandria. Also may it be seen from the fact that the firemen were pointed out as being especially fiery and riotous.

The houses of Rome were very high, and almost always their upper stories were made of wood; this, added to the fact that the streets were generally narrow, will show how easy it must have been for conflagrations to spread. The city suffered terribly from fire many times, and several times was almost entirely consumed. Every precaution was taken, such as compelling persons to build their houses a certain distance from each other, instituting bodies of public and private watchmen, and the like, and these means, when faithfully and diligently used, were no mean preventives; but what was really needed was engines more nearly approaching to perfection, both in construction and handiness; and we find that the law at one time required every citizen to keep a private engine or *sipho* in his house.

With such inefficient apparatus was Rome guarded from fire.

In the dark ages conflagrations were common and disastrous throughout Europe, and the use of even the old engines seems to have been forgotten, certainly they were hardly used;

and this fact may, among other things, be attributed to a superstition, by no means uncommon, that fires, plagues, and great calamities were visitations of Providence, and that it was impious to attempt to prevent them or to obtain mastery over them when they actually existed. The helplessness and ignorance of superstitious people are perhaps nowhere more clearly seen than in the fact that in medieval times it was believed that the most efficacious means against fire was the ringing of sacred bells and the exorcism of demons, who were apparently supposed to be very inflammable personages; and certainly, if we consider the temperature of the place whence they were supposed to come, the opinion would not seem to be altogether unfounded.

Syringes were in use in London till far into the seventeenth century. They were of brass, and the largest of them held no more than a gallon. Three men were required to work one of them—two to hold the instrument and one to work the piston. We, at this age of the world, sometimes have extensive fires, notwithstanding our improved methods of extinguishing them; but to see how unmanageable such calamities must have been two centuries ago—as at the great fire of 1666, when London was destroyed—it is only necessary to observe that, supposing one of the syringes then in use could be filled and discharged four times in a minute, four gallons only could be applied in that time by one instrument. A steam fire engine can throw twelve hundred gallons per minute a distance of two hundred and ten feet. Even supposing—a supposition manifestly absurd—that the syringe could throw water the same distance, it would require nine hundred men to do the work now done by one or two. All things being considered, fifty thousand syringes would not be as serviceable as one steam fire engine. As Ewbank says, "the whole act of using them appears rather as a farce or the gambols of overgrown boys at play than the well directed energies of men to subdue the raging element."

In the sixteenth century syringes were made which differed from those previously in use only in being larger and being placed on wheels. A picture of one of these is preserved in Besson's "Theater," and looks, for all the world, like an immense sausage stuffer, capable of holding about a barrel of water. It had no hose (the ox's gut contrivance had been lost during the middle ages), and consequently the direction of the stream of water could not readily be changed, had the contrivance been placed simply on wheels. To avoid this difficulty, the syringe swung on pivots, and thus could be elevated and depressed, but when motion from side to side was required, the whole machine had to be turned.

It has already been said that pumps were used in very ancient times; but these, too, were lost in the darkness of the Middle Ages, to appear again in Germany near the close of the sixteenth century. A picture of the pump for extinguishing fire, given by Decaus, shows that it was worked by four men, two of whom pumped, while one held the "squirt," and another turned pailfuls of water into the machine. If a covered washtub be put on a sled, a board nailed to one side and rising two or three feet higher than it, and the whole thing considered a churn, the top of whose handle is inserted in a lever, one end of which is inserted in the board and the other end worked by hand, a very good idea of this pump will be obtained. The whole contrivance was a single forcing pump secured in a tub; afterwards, as in Hautsch's engine—a very efficient one—two pumps were employed, but it was not till some years later, that the air chamber and hose came into use; and thenceforth, until the invention of steam fire engines, variations in structure were simply those of detail in convenience of carriage and working.

SLATE PENCILS.

Twenty years ago all the slate pencils used were manufactured in Germany. She then supplied America with this commodity. In 1850, there was a young man living in West Rutland, Vt., eighteen years of age, who fortunately discovered a supply of stone for making a first-class article of slate pencils. He began by whittling out the pencils and selling them to school children. Being a better article than that for sale in the stores, he found a ready sale for all he could whittle out.

He argued that if they would sell thus readily at home, they would sell readily everywhere. He became possessed of the idea that there was a fortune in the business, and his dream has been realized. This quarry of slate pencil stone was situated in a large ravine, four miles north of Castleton, Vt., near Bomoseen Lake. The land on which it was situated was for sale at one hundred dollars. He purchased it, and began operations by sawing out the pencils and whittling them round.

The business of making them grew immensely on his hands so that it was impossible to keep a clean order book.

Machinery was invented to facilitate the process, which has reached something like perfection, and enormously increases the production of pencils. At present the quarry and mills are owned by a joint stock company. They are valued at three hundred thousand dollars. From fifty to one hundred thousand pencils are turned out daily, and upward of a hundred hands are employed in the quarry and in the mill.

After the stone is quarried it passes through four processes before it is made into pencils. It is sawn into rectangular blocks five inches by seven, and split by hand into slabs of the same length and breadth, which are carefully assorted. These slabs pass through a machine which shaves them all to the uniform thickness of a quarter of an inch, when they are ready for the final process.

The machinery for reducing these slabs to pencils, consists of iron plates fitted to receive them, fastened to an endless chain which passes over rollers at either end.

These plates, of which there are about twenty on a chain, each receive a slab, and as it passes from one roller to the other the pencils are cut and rounded out half way to completion by semi-circular knives; a dozen different sets of knives being firmly fastened above them.

The slabs are then turned over and passed back through another machine exactly similar, and a perfect pencil is the product.

They are counted out by children and packed one hundred in a box. The pencils are sold by the manufacturers at half a cent a piece or fifty cents a box, or ten times the cost of slate pencils in Germany, where one thousand can be bought for less than fifty cents. Being made from a superior article of stone they are used throughout the United States in preference to those imported from Germany.

The slate pencil business, like the pin business is a small one in itself, but becomes large where it is necessary to supply all the school children of America with pencils. Twenty years ago the whole idea of it was in the brain of a young Yankee boy. To-day it is a business involving over a quarter million of money. It has been and will continue to be a profitable business as this is the only quarry and slate pencil mill in the United States.

Besides manufacturing the pencils the firm have a mill for grinding the stone to flour, bolting it finer than fine flour, to be used in the process of manufacturing paper, especially wall paper. This flour sells for twenty dollars a tun. The stone from which the pencils are made contains upwards of thirty per cent of alumina, from five to eight per cent more than the stone from which slate pencils are manufactured in Scotland. The company are putting up buildings and will soon be manufacturing alum on a large scale.

ON COTTON SEED AND COTTON SEED OIL.

BY C. WIDEMANN, CHEMIST, PARIS, FRANCE.

No. II.

THE OIL.

The quality, color, and density of the oil depend a great deal on the way it has been manufactured, the atmospheric air and heat having a great effect upon it, and also the condition of the seed. At first the crude oil is of a light yellowish green shade, but it soon becomes darker by oxidation of the coloring matter alluded to in the previous article.

Its fluidity is from 28 to 30 times less than that of water. Its density or specific gravity varies a great deal according to its temperature. At 54° Fah. (12·2° Cels.), it is 0·93074; at 58° Fah. it has a density of 0·93169. The specific gravity of a portion of the latter, after having been submitted to a current of steam at 212° Fah., and a thorough washing with boiling water, after filtering, increases to 0 9343305 at 52° Fah., care having been taken to have the sample freed from any adhering water by having a portion of the oil heated up to 212° Fah. for several days.

This crude cotton seed oil is soluble freely in ether, benzine, sulphide of carbon, and benzole, but not sensibly in alcohol even by the application of heat; the alcohol, however, takes up from the oil a portion of the substances which imparts to the oil its peculiar color.

The behavior of crude oil with reagents is certainly rather peculiar, but it should be borne in mind that the crude oil contains a large proportion of vegetable impurities which, no doubt, play an important part in regard to the reagents wherewith the oil is brought in contact. With sulphuric acid, concentrated, it causes a beautiful purplish color, which becomes stronger developed by stirring. After standing for twenty-four hours, the mixture is much thickened, and brownish red-colored. Solution of bichromate of potassa in strong sulphuric acid, being mixed with the oil, causes an energetic reaction to take place, sulphurous acid is evolved, and the color becomes deep blood-red. After standing for 24 hours the mixture exhibits a solid blackish mass.

With strong nitric acid, the color at first is dark olive green, but soon changes to light orange red. After 24 hours the oil is found solidified, and exhibits a dark orange red color.

With a solution of caustic potassa of a specific gravity of 1·22, the oil becomes thick, at first of a rather light yellowish color, while the solution of potassa becomes colored. On stirring the mixture with a glass rod those parts of the test tube, where air has more easy access to the mixture of oil and alkaline solution, assume a tinge of blue-purplish color. After 24 hours the oil becomes solidified. The bottom portion of the test tube, wherein the greater part of the solution of potassa separates, shows that solution deeply orange colored, and the blue purplish color is a shade darker. The same phenomenon is observed with caustic soda.

With strong ammonia a change of color to yellowish green.

Protonitrate of mercury, in aqueous solution, changes the color of the oil to a greenish yellow; after 24 hours the oil becomes solidified and the color dark olive green.

Strong phosphoric acid at first hardly affects the oil, but after 24 hours the oil becomes thicker and of an olive green.

With lime water the oil becomes soon solidified and of a brownish yellow color.

Sulphurous acid gas does not discolor the oil passing through it. Neither have some metallic combinations any decoloring effect on the oil; for instance, neither chloride of zinc, chloride of tin, acetate of lead, nor sulphate of zinc, has any effect in withdrawing from the oil its peculiar color, or if even some change appears to take place, it is not permanent.

In its oxidized state, and no doubt, also, under the influence of vegetable substances met with in the oil, the coloring matter appears to have a tendency to stick to fatty matters.

The crude oil freezes at 2° to 3° Cels., or 26° to 28° Fah., and this property is applied in this country to the manufacture of stearine and winter-pressed oil—which is pure oleine, used for lubricating purposes.

The weight adopted by oil merchants is 7½ lbs. of crude or refined oil to the gallon.

The specific gravity of the refined oil which has a yellowish color and is richer in oleine than in stearine, as it has been generally refined by a semi-saponification by the use of alkalies, which operation transforms a large amount of the stearine into stearates, is of 0·92647 at 61° Fah., or 16° Cels.

The crude oil is very similar in every respect to linseed oil in density and color, and can be classed among the drying oils used for painting.

In using it for painting purposes it has answered pretty well, though it appears to become sticky in damp weather. To prepare it for painting it is generally treated like linseed oil, that is boiled with oxidizing agents or litharge, or black oxide of manganese, but I have obtained better results with another agent, as I shall prove further on.

THE CAKES.

As an average from 1,000 lbs. of meal, 730 lbs. of cakes are obtained, each cake weighing from 7 to 7½ lbs. These cakes are at first of a yellowish green, but become darker by age. They are nearly all shipped to England, where sometimes they are reground and repressed for the oil. They bring from $30 to $40 per tun; ground into meal they bring at retail about $2 per 100 lbs. The same bags used for the seed are used to ship the cake.

USES OF THE COTTON SEED OIL, CRUDE, REFINED, BLEACHED, CAKES, MEAL, ETC.

As we have already seen, the husks have found their application, and it appears that everything in this extraordinary plant, called the cotton tree, with its productions, have their use and their applications. The cotton-seed oil (crude) is mostly used in soap manufacture, giving a remarkable fine soap, it is also used to grease wools, for adulterations of linseed oil, for its stearine products, its oleine, and for lubricating purposes. Refined, it takes the place of olive oil. It is used for cooking, for adulterations of lard oil, the oleine having the property of remaining at a low temperature without hardening, is used as a lubricator, white or bleached it is used for burning, and for adulterations of the finest qualities of lard oil. The cakes are used for feeding cattle, and the meal is used in adulterations of linseed meals. It is used for medical purposes, and also for adulteration of mustard meal.

Now that we have become acquainted with the article produced, I shall go through the manufacture of it, refining and bleaching.

New Facts About the manufacture of Illuminating Gas from Mineral Oils.

Our cotemporary, the *Deutsch Industrie-zeitung*, communicates some interesting facts on the above topic, they being taken from a report of the gas inspector, Herr Mehlis, to the Association for the advancement of the mineral oil industry in Halle upon the Saale. The experiments undertaken have proved in the first place that the value of the oils, for the purpose referred to, depends upon the quantity of the paraffine they contain. The larger the percentage of the latter, the greater the yield and the better the quality. Still no essential factor for the valuation of the gas could be discovered either in the specific weight or in the degree of purity of the product; so much, however, has been ascertained, that the residue in the retort increases proportionally with the specific weight of the gas, and the quantity of the products of condensation with the boiling point. No definite conclusions have as yet been arrived at as to the most proper form of retorts, but the committee by which the experiments were conducted, is of the opinion that a cylindrical shape is to be preferred to any other, on account of the fact that the otherwise expensive repairs of the parts of iron are mostly avoided. No essential difference between the round and oval retorts could be ascertained. The use of pipes of decomposition is recommendable in so far as they enable the production of a certain quantity of gas with less furnaces. In regard to the temperature, a dark cherry-red heat was in all instances found most convenient. The illuminating gas from mineral oils distinguishes itself, as well known, by its richness in carbon, a great density and high luminosity; but, as the high cost of production of this gas can only be lessened by a proportionally high luminosity, it is above all necessary to select such burners and apply such a pressure as will develop the maximum of illuminating power. With regard to the application of different burners, it was found that gas which was prepared from one and the same oil yielded between 3·8 to 10·4 units of light per cubic foot; but with proper burners, the gas from mineral oils yields four times greater luminosity than ordinary gas, and, with regard to the construction of the apparatus, although they may be yet subject to many alterations, it can be said to have arrived at a point where the erection of larger works may be unreservedly commended. The city of Zeitz has, in fact, already made the necessary alterations in its gas-works, in order to be able to produce the new gas, at least during the summer months. The crude material is paraffine oil, as obtained in the distillation of shales, 1,000 cubic feet of gas being obtained from one barrel, which is got at the price of 2½ Prussian thalers. The cost of production of this quantity is stated to amount only to 4⅓ thalers, while this volume is disposed of at 12 thalers.

ACCORDING to Reinsch, timber may be rendered incombustible by saturation with common salt, as well or better than by the use of water-glass, and a further advantage from salt thus applied, is a prevention of damage from certain insects.

Summary of the Results of the Experiments made to Ascertain the Economy of the Non-Condensing Steam Engines, at the American Institute Exhibition of 1869. Extract from the Report of Charles E. Emery.

TABLE.

		Babcock & Wilcox.	Harris.
a	Duration of experiment............Hours.	8·00	8·00
b	Diameter of cylinder..............Inches.	16·00	16·13
c	Stroke of piston.................... "	42·00	42·00
d	Revolutions per minute..................	60·241	60·273
e	Steam pressure in main pipe.....Pounds.	81·69	80·51
	Mean initial pressure in cylinder per indicator................Pounds.	76·148	70·943
	Point of cut-off in fractions of the stroke........................	·189	·216
	Mean terminal pressure in cylinder, per indicator..............Pounds.	3·055	5·178
	Mean effective pressure in cylinder, per indicator.............Pounds.	31·057	29·728
	Mean back pressure (independent of cushion) ....Pounds.	·800	·690
	Mean friction pressure.......... "	2·848	1·786
	DISTRIBUTION OF THE POWER.		
h	Indicated horse-power.......................	78·792	76·579
i	Friction of engine per indicator diagrams...........................H.P.	7·225	4·601
j = h − i	Difference—gross load .... "	71·567	71·978
k = j × ·04	Extra friction of engine caused by load.	2·863	2·879
m = j − k	Difference—{Net or effective horse-power transmitted thro' belt.} Horse-power.	68·704	69·099
n	Dynamometer horse-power...................	64·752	67·314
o = m − n	Difference—{Friction of connecting shaft.}	3·952	1·785
	WATER.		
p	Feed water per hour by meter..Pounds.	2,007·746	1,995·547
q	Steam per hour by indicator.... "	1,585·196	1,815·723
r = (100 q ÷ p)	Percentage of water accounted for by indicator..............................	79·47	90·99
	COST OF THE POWER.		
s	Water per indicated horse-power per hour.......................Pounds.	25·482	26·059
t	Water per net horse-power per hour..........................Pounds.	29·231	28·380
u	Water per Dynamometer horse-power per hour..............Pounds.	31·007	29·645
v = s ÷ 9	Coal per indicated horse-power per hour, calculated from Water.........................Pounds.	2·831	2·895
w = t ÷ 9	Coal per net horse-power per hour, calculated from water..Pounds.	3·248	3·200
x = u ÷ 9	Coal per dynamometer horse-power per hour, calculated from water.....................Pounds.	3·445	3·294

This table is a brief summary of the results of the experiments. The lines have been designated by letters for convenience of reference. The mean power developed in the cylinders, during each trial, in excess of that required to displace the back pressure of the atmosphere is shown in line, *h*, marked "Indicated horse-power."

The useful work done by each of the engines equals the power transmitted through its belt to the shafting, and must be obtained by adding to the dynamometer horse-power the power required to overcome the friction of the connecting shaft which carried the receiving pulleys of all the engines. The friction of this shaft was not the same for the two engines.

Having, however, both the indicated and dynamometer horse-power, the friction of this shaft in the two cases has been found, as shown in the table under the head of the "Distribution of the power." From the indicated horse-power (line *h*) is first subtracted the "Friction of the engine" per indicator (line *i*), and the remainder is the gross load (line *j*). The extra friction caused by the transmission of this load would usually be reckoned at 7½ per cent; but in these cases it was apparent that it was much less, for the reason that during the trial the lubrication was very well attended to. The low coefficient of 4 per cent has therefore been used to obtain the friction of the load (line *k*) which is substracted from the gross load, and the remainder (line *m*) equals the net or effective horse-power transmitted through the belt, or, in other words, the useful work done. From this is subtracted the dynamometer horse-power (line *n*), and the remainder equals the friction of the connecting shaft (line *o*), which shows by actual measure that the friction of the shaft, when the belt of the Babcock & Wilcox engine was in position, was much greater than when the belt of the Harris engine was in use.

Line *p* shows the average amount of water per hour pumped into the boilers, as measured by the meter.

Line *q* shows the quantity of water used, as calculated in the usual manner from the weight of the steam at the mean terminal total pressure shown by the indicator diagrams. The specific volumes of the steam were ascertained from tables founded on the experiments of Regnault and others.

The facts required for this calculation are shown in the table: namely, 1st. The terminal pressure from the indicator diagrams; 2d. The atmospheric pressure shown by the barometer (the total pressure equals the sum of the two); and 3d. The dimensions necessary to calculate the capacity of the cylinder clearances, etc., at the termination of the stroke of the piston.

Line *r* shows the percentage of the water used, which is accounted for by the amount of steam present in the cylinder at the end of the stroke.

The deficiency in each case shows, of course, the amount of water present with the steam at that point. A portion of this water was, undoubtedly, the steam condensed for the performance of the mechanical work, which was very nearly the same in the two cases.

Under the head of the "Cost of the power" are shown the water and coal required for the indicated, the net, and the dynamometer horse-powers. The coal required for the several kinds of power as shown in this table (lines *v*, *w*, and *x*) has been calculated from the water (lines *s*, *t*, *u*), on the assumption that the engine was supplied with steam from a boiler which would uniformly evaporate nine pounds of water per pound of coal. This evaporation is a fair result for a good boiler, and would have been produced by those used in the experiments had the feed water been heated, as in usual practice, and the evaporation uniformly equal to the result on the second day of the trial.

The trial between the Babock & Wilcox and Harris engines possesses considerable scientific interest, from the fact that the cylinder of the former was steam-jacketed, while that of the latter was made direct from the Corliss patterns, and without a jacket. The jacketed cylinder of the first-named engine was surrounded by an air jacket, having a polished external covering. The Harris cylinder was clothed with felt under a wood casing, with the exception of the steam chests, which were exposed and polished. The engines were of the same size, and as they were run also at the same speed the results are in every respect comparable.

The economy of these two engines is very remarkable. The best results possible by theory for an engine working under the circumstances of this trial is 21 pounds of water per indicated horse-power per hour, and both engines approached this limit very closely.

The steam applied to the Babcock & Wilcox engine was quite wet during much of the time, as was observed particularly by one of the judges and other persons present. This can only be accounted for by the same difference in firing, or in operating the fire doors, which caused the difference in coal.

The steam was dryer during the trial of the Harris engine. These observed facts are proved also by the meter and indicator measurements of the water (see lines *p* and *q*, the table, for only 79·47 per cent of the water pumped into the boiler was present as steam in the cylinder at the termination of the stroke in the Babcock & Wilcox engine, while the Harris engine showed 90·99 per cent (see line *r*), the deficiencies in the two cases show the amount of water present with the steam, and equaled, therefore, 20·53 per cent of the whole in the Babcock & Wilcox engine, and 9·01 per cent for the Harris engine.

The difference in the friction of the two engines is accounted for in the report by the undermining with water of the foundation of the Babcock & Wilcox engine.

UNITED STATES CIRCUIT COURT---SOUTHERN DISTRICT. BEFORE JUDGE BLATCHFORD.

PATENT SHADES—INFRINGEMENT.

Stewart Hartshorn vs. Lemon A. Tripp et al.—This was a bill in equity for an injunction and an account of profits, founded on an alleged infringement of reissued letters patent granted to the plaintiff August 27, 1867, for an improved shade fixture, on the surrender of letters patent, granted to him as inventor, October 11, 1864.

The invention, as stated in the specification, relates to an improvement in that class of shade fixtures in which the shade roller is provided with a spiral spring for the purpose of automatically winding up the shade, and consists of an apparatus by means of which the shade may be stopped and retained at any desired hight by a simple manipulation of the shade. The defendants contended that the mode of operation of the shade fixture made by them is so different from that of the fixture made by the plaintiff as to relieve them from the charge of infringement. They also attacked the novelty of the plaintiff's invention, producing the testimony to the effect that an apparatus similar in operation to the invention of the plaintiff was in existence thirty-five years ago.

Held by the Court—That the fixture made by the defendants embodies the substance of the invention of the plaintiff. There is no difference between the two modes of operation so far as regards the real invention of the plaintiff and the scope of the claim of his patent. It may be that there is something in the defendants' arrangement that is patentable as an improvement on the device of the plaintiff, but that gives them no right to use such improvement without the license of the plaintiff, so long as the fixture embodying it contains, as it does, the invention patented by the plaintiff. The infringement by the defendants is therefore established. That inasmuch as the fixture referred to in the testimony is not shown to have been operated and used in a manner fairly accessible to the public, and passed out of existence, giving no hint to any one that it was of any use, and since the plaintiff never had any knowledge of it, it cannot be set up to invalidate his patent. (Gayler vs. Wilder, 10, How 477; Cahoon vs. Ring, 1 Clifford, 592, 611, 612). There must be a decree for the plaintiff for a perpetual injunction and an account of profits with costs.

For the plaintiffs, S. D. Law; for the defendants, C. M. Keller.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

Carriage Clip.—Clement St. James, Pittsfield, Mass.—This invention has for its object to furnish an improved carriage clip or thill and pole coupling, which shall be simple in construction, easily made, inexpensive, and at the same time, strong, durable, and noiseless.

Horse Hay Fork.—Edwin G. Crandall, Belfast, N. Y.—This invention has for its object to furnish an improved horse hay fork, simple in construction, strong, and durable, not liable to get out of order, and convenient and reliable in use.

Washing Machine.—George W. Stranahan, Westport, N. Y.—This invention has for its object to furnish a simple, convenient, and effective washing machine, which shall be so constructed and arranged that it may be also used as a boiler for heating the water and boiling the clothes.

Horse Hay Fork.—F. W. Thoria, Hoskinsville, Ohio.—This invention has for its object to furnish an improved horse hay fork, simple in construction, easily operated, and effective in operation, being so constructed as to be readily thrust into the hay, and which will hold the load securely until it is discharged.

Ties for Hollow Walls.—Edwin Tuttle, Fareham, England.—This invention relates to a new and useful improvement in ties for hollow walls, and it consists in the use of thin metallic plates placed on edge in the wall.

Spike Puller.—William Kegg, Lassellsville, N. Y.—This invention relates to a new and useful improvement in a machine for pulling spikes, more especially designed for pulling railroad spikes but applicable to other purposes.

Inclosed Folding Spring Bed.—Louis Derome, San Francisco, Cal.—This invention has for its object to improve the construction of the improved folding bed, described in letters patent No. 33,935, granted to the same inventor, March 31, 1863, so as to make it more convenient and effective in use.

Hand Barrow.—Minot S. Scofield, Stamford, Conn.—This invention has for its object to furnish an improved hand barrow, designed for use in handling barrels, boxes, and other packages, and which shall be so constructed that it will adjust itself to various sized packages.

Horse Power.—James Fraser and William Thomas, New York city.—This invention has for its object to furnish a simple, strong, durable, and convenient horse power.

Table.—Lambert Freeman, New York city.—This invention has for its object to improve the construction of tables, so as to make them stronger and more durable in construction, and adapt them to be used as extension tables when required.

Cotton Seed Huller.—W. P. Callahan and D. R. DeRush, Dayton, Ohio.—This invention consists of a stationary and a running disk, working face to face, in the manner of grinding stones, and provided with steel plates in the faces set edgewise, projecting above the faces and arranged so as to have a shear action from the eyes of the disks outward, between which disks the seed are passed in the usual way.

Side Droppers for Harvesters.—W. G. Beels, Independence, Iowa.—This invention relates to improvements in side dropper attachments for harvesters, and consists in the combination with the apron of a carriage arranged to receive the grain as it falls and convey it backward to the rear side of the apron previous to discharging, away from contact with the grain cut while discharging, on which carriage a discharger, consisting of a series of arms reaching across the carriage and hinged at one side, is arranged to be turned up when the carriage has moved the grain back for discharging it.

Needle Case.—Wm. Avery and Albert Fenton, Redditch, England.—This invention relates to improvements in needle cases, and consists of an outer sheath, packet, or case, inside of which are arranged two or more cases or packets for needles, which are worked upwards and partly out of the end of the outer case, when required, by means of cranks or arms upon a small center, and having a thumb-bit projecting through and working in a curved slot in the outer case, one packet being attached to each arm and the arms so arranged that the motion of the thumb-bit simultaneously raises one packet and depresses the other.

Sled Brake.—L. P. Mosher, Stoney Creek, N. Y.—This invention relates to improvements in sled brakes, such as are set into action by the holding back action of the horses, and has for its object to provide a powerful brake, which when the horses are drawing, will be supported close under the sleigh bottom, out of the way, and which when brought into operation will not cut up and derange the paths wherein the horses travel. It is also designed to provide, in conjunction with the said brake, holding pawls or dogs pivoted to the rear ends of the runners, to be operated by the same means, and which will also act as brakes.

Wagon Jack.—Charles W. Mosher, East Leon, N. Y.—This invention relates to improvements in lifting jacks, and it consists in a combination on a platform, of a vertical hollow stand, or tube, having a long vertical slot extending from the platform upward, a vertically moving piston in the said hollow stand composed of a tube and a rod, adjustable as to length, and a T-headed operating lever and friction roller, connected to the lower end of the piston, the said roller operating as a movable fulcrum for the lever, which being worked up and down, will cause the head of the lever to assume either a vertical or horizontal position, thereby raising or lowering the piston on the top of which the weight rests.

Capstan.—John Ericsson, New York city.—This invention has for its object to improve the construction of ships' capstans, so as to simplify the mechanism, increase the safety, reduce the expense, and facilitate the repair of the same. The invention consists, chiefly, in a novel manner of hanging the chain barrels, and of connecting them with the capstan proper, so that they can be readily and safely disconnected for dropping the anchor, and in the employment of eccentric shafts for holding them out of gear. The barrels are fitted loose around vertically adjustable shafts upon which gear wheels are mounted. These gear wheels connect with the barrels by clutches, and thereby revolve the same. When one shaft is elevated with its gear wheel its chain barrel will be entirely out of gear and will allow the anchor to drop.

Self-Acting Thread Guide for Bobbin Winder for Sewing Machines.—Thomas Shanks, Baltimore, Md.—This invention consists of a mechanism to be attached to the ordinary apparatus for winding thread upon the shuttle bobbins of sewing machines, for the purpose of laying the thread evenly upon the bobbins, said mechanism deriving the motion from the shaft that rotates the bobbin, and therefore moving always with a speed bearing the same proportion to the velocity of the bobbin, whether that be greater or less.

Boiler.—A. N. Merrill, Batavia, Ill.—This invention consists of various improvements in boilers for farmers' use, in the preparation of feed for stock, all tending to increase the efficiency of the apparatus.

Fastening Boxes to Grain Wagons.—George Seitzinger, Seneca, Ill.—This invention has for its object to provide means for increasing the capacity of the box of any ordinary wagon to adapt it for use in carrying grain and it consists in a hook-and-eye fastening for extra side boards which form a top box.

Apparatus for Straightening Car Axles.—B. S. Skates, Whistler, Ala.—This invention comprises a pair of housings having adjustable screw centers for suspending the axle by the "centers" in the ends and adjustable track for rolling the wheels and axle between the housings at the right hight to be taken by the centers, and a bending or straightening jack, to be placed under the bends in the axles to force them up to a straight line, the ends of the axles being secured by wedges under lugs on the housings to resist the upward pressure of the jacks.

Clothes Sprinkler.—T. Rice Smith and James T. Mitchell, Jacksonville, Ill.—This invention relates to improvements in sprinklers for sprinkling clothes, floors, carpets, windows, etc., and it consists in the combination with a metal or other cup or disk, provided with a suitable handle, of a sponge confined in the said disk by wires attached to the edge of the disk and bent over the sponge, or a holder made wholly of wire, and provided with a handle may be used in substitution of the disk.

Twister for Twine.—James McIntire, Hopewell Cotton Works, Pa.—This invention consists in an improved arrangement for holding down the arms that support the upper ends of the bobbin spindles, together with a simple and convenient substitute for the standards and leather belt around, the lower ends of said spindles.

Churn.—J. A. and G. C. Hanger, Churchville, Va.—This invention consists chiefly in making the cogwheel that engages with the balance-wheel pinion, and which bears the crank by which the gearing is operated, adjustable with reference to said pinion, so that said cog-wheel may be placed in a position to suit the convenience of the operator.

Pipe Coupling for Heating Cars.—Henry R. Robbins, Baltimore, Md.—The object of this invention is so to improve the construction of the ball and socket joint, employed in connecting the pipes of one car to those of another, that with such joint the pipes can be easily connected or separated, when necessary, while the coupling shall be steam tight, and shall readily yield to the motion of the cars.

Medical Compound.—Mary J. Hanson, Mauston, Wis.—This invention has for its object to furnish an improved medical compound, simple in its ingredients and preparation, and very effective for the cure of cholera morbus, diarrhœa, dysentery, colic, and similar diseases of the bowels.

Pipe Tongs.—John Clark, Astoria, N. Y.—This invention has for its object to furnish an improved pipe tongs, simple in construction and effective in operation, and which will operate with equal efficiency upon various sizes of pipe.]

Screw Driver.—David Drummond, McGregor, Iowa.—This invention has for its object to so construct a screw that it may be revolved like a brace for rapid, light work, or in the ordinary manner, by revolving the handle. The invention consists chiefly in so securing the handle that it may be swiveled or locked rigidly to the shank of the tool by means of a sliding ferrule.

Grater.—Stephen S. Wilcox and Eli J. Colegrove, Linklaen, N.Y.—This invention relates to a new revolving grater for all kinds of vegetables, and consists in a novel manner of hanging the grater so that it can be readily taken out of the supporting frame or vessel to be cleaned.

Grain Cleaner.—Charles Jones, De Soto, Ill.—This invention relates to improvements in machines for cleaning grain, and consists of a series of screws of the form of truncated cones, arranged one above another around a vertical shaft in a frame, the small end of each opening into the large end of the next below, above a concave disk on the shaft; and a rotary fan also connected to the said shaft, the whole being arranged to separate the small matters through the screens, and to cause the light grains and refuse matters to rise to the top of the heavy grains by the quantity of the heavier grains, and to be upheld by centrifugal force and by the blast.

Apparatus for Preparing Wool or other Fibres.—Edward Holden, Laurel Mount, Baildon near Leeds, England.—This invention consists in a combination of several sets of gills, arranged in one machine, each set moving faster than the preceding set, and drawing rollers being arranged for conveying the fiber from one set to the other.

Summer Cooking Stove.—A. H. Wellington, Woodstock, Vt.—This invention relates to an improvement in cooking apparatus designed for summer use.

Keyhole Guard.—J. L. Russell, Prairie City, Iowa.—The object of this invention is to provide a safe and efficient means for protecting door locks from the depredations of thieves and burglars, and it consists in arranging a sliding guard for covering the keyhole, and also a catch for holding the keyhole guard in place.

Butter Excavator and Print.—N. J. Eaton, Montana, Iowa.—This invention has for its object to furnish a device by means of which butter may be printed or stamped, and removed from a firkin, tub, or jar, in pieces of suitable shape and size to be placed upon the table, and in such a way as to leave the butter remaining in the vessel undisturbed.

Journal Boxes and Journals.—Jeremiah McIlvain, Churchville, Md.—This invention relates to new and useful improvements in boxes for shaft journals and in the journals themselves, whereby the journals are kept cool and properly lubricated.

Freight Car Lock.—J. L. Howard, Hartford, Conn.—This invention relates to locks for fastening the doors of railroad freight cars, having especial reference to locks where the bolt secures a hasp.

Lantern.—E. F. Haskell, Sherman, Me.—This invention relates to improvements in lanterns, and consists in an improved construction and arrangement of the three-sided tin shell or case made of polished tin or other reflecting substance, for reflecting the light of the lamp within, to diffuse it throughout the room.

Runner Attachment for Wagons.—J. W. Moore, Watseka, Ill.—This invention relates to improvements in the application of runner attachments to wagons, and consists in the employment of axle-supporting beams in substitution for the common axles, adapted for the support of short independent axles, for the wheels or bolts for connecting the bob-runners, so that the wheels or runners may be applied at any time as required, the said beams being the length of the distance between the wheels, and provided with two bearings for each axle, one at each end and the others near the center, and recesses are formed between the bearings for the reception of sleeves or hollow knees on the bob-runners by which they are connected to the beams, by bolts taking the places of the short axles of the wheels.

Flood Gate.—J. J. Kimball, Naperville, Ill.—This invention relates to improvements in self-opening flood gates, and consists in the combination with the main gate arranged between the two waters of a flume on trunnions, at or about the center lengthwise, and to stand in an inclined position when in the normal condition, of one or more auxiliary gates in flumes at the sides, with bulkheads over which the water will fall in times of floods, against the lower ends of the said auxiliary gates journaled at the upper ends, and carrying arms on the said journals, which, working in spaces in the walls of the flume, where they will not encounter floating ice or drift wood, will bear upon journals or friction rollers projecting into the said spaces from the upper end of the main gate and turn it on its trunnions to raise the lower end, and allow the water to escape under it

Cotton Planter.—E. L. Sykes, Okolona, Miss.—This invention relates to improvements in cotton planters, and consists in arranging the wheels adjustably on a long axle, so that the machine may be used to plant the rows at different distances from each other; also, in an improved covering and clod scraping attachment, the latter being arranged to move the clods away from the drills in advance of the coverer.

Road Scraper.—James Howland, Rock Falls, Ill.—This invention has for its object to provide a scraper by which the earth may be gathered from both sides of the road at once, and deposited on or about the center, in a raised oval bed, and which may be readily guided and navigated on the line of the road bed, or prevented from being thrown from side to side by unequal obstructions on either side.

Corn Sheller.—Rupert Pfeifer, Linz, Austria.—This invention relates to a new corn sheller, which is so constructed that any person can readily and rapidly remove the kernels from the ears of corn by hand alone and without the use of stationary machinery.

Chair.—Wm. H. Joeckel, New York city.—This invention has for its object to so construct a chair whose seat can be folded up or down at will that the said seat will, when swung down, be supported by the jointed arm-rests of the chair, no fixed stop being required either in the front or rear of the pivot. Another object of the invention is to provide chairs for sunday schools and lecture rooms, which will be adjustable both to children and adults.

PERCUSSION CAP CARTRIDGE CASE.—Sewell Newhouse, Oneida Community, Oneida, N. Y.—This invention relates to that class of metallic cartridge cases where a percussion cap is affixed to the case for igniting the charge, and consists in a movable anvil to which the cap is attached, by means of which the exploded cap is readily removed from the nipple.

THILL COUPLING.—J. I. Peck, Evansville, N. Y.—This invention relate to a new and useful improvement in the mode of coupling thills to buggies and other carriages.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

R. T. W., of Mo.—The horse power of any head of water is found by multiplying the number of pounds which fall per minute into the distance it falls, and dividing the product by 33·000.

J. H. McH.—We think your proposal not a very practicable one, yet if you wish to make it over your signature in our columns, we will give you the opportunity.

S. M. G., of Ca.—The force by which the circulation is kept up in plants is undoubtedly principally that called capillary attraction.

R. S., of Nova Scotia.—The siphon barometer was invented by Gay Lussac, not Torricelli, as you suppose.

F. G. H., of Vt.—It is estimated that the greatest amount an average horse can pull in a horizonal line will raise a weight of nine hundred pounds, but he can only do this momentarily. In a continued exertion he would probably not be able to do more than half that.

A. W., of Md.—We believe a concrete made of gravel or sand and Portland cement, or of gravel, sand, coal ashes, and coal tar, would make an excellent pavement for a farm yard. The latter is very easily made. You must dig away the earth to the depth of say five inches, then lay a bottom of pebbles, ramming them well down with a paving rammer. Sweep them off as clean as possible with a broom, and pay over the surface thinly with hot coal tar. Now put on a coat of smaller gravel (the first bed of pebbles should be as large as goose eggs), previously dipped in hot coal tar drained and rolled in coal ashes, with an intermixture of fine gravel, and roll it down as thoroughly as possible. Let the roller run slow, and let a boy follow it with a hoe to scrape up all adherent gravel. Next put on a coat of fine gravel or sand and coal tar with some coal ashes to complete the surface, and roll again as thoroughly as possible; the more rolling the better. It will take some weeks to harden, but makes a splendid hard surface which sheds water like a roof. Do not use too much tar. It is only necessary to use enough to make the ingredients cohere under pressure, and a little is better than too much. Such a surface will last in a farm yard a great while.

J. G. B., of Conn.—You may color different metals by the following method: Make a solution of four ounces of hyposulphite of soda in a pint and a half of water, and add a solution of one ounce of acetate of lead in the same quantity of water. Articles to be colored are placed in the mixture, which is then gradually heated to a boiling point. The effect of this solution is to give iron the effect of blue steel, zinc becomes bronze, and copper or brass becomes successively yellowish red, scarlet, deep blue, bluish white, and finally white with a tinge of rose. This solution has no effect on lead or tin. By replacing the acetate of lead in the solution by sulphate of copper, brass becomes of a fine rosy tint, then green, and finally, of an iridescent brown color. Zinc does not color in this solution, it throws down a precipitate of brown sulphuret of copper, but if boiled in a solution containing both lead and copper, it becomes covered with a black crust, which may be improved by a thin coating of wax.

N. P. C., of La.—You are entirely right in your views in regard to the adaptation of steam plows to needs of large sugar estates, and you are right also in regard to immense sacrifice of power in friction on draft plows. From your description we think your ideas are good, and shall be happy to give an opinion on your drawings. Send them along.

C. & Co., of Ill.—The deposit you send us proves to be chiefly carbonate of lime. It is deposited in a form very easily removed by blowing off. If the rapidity with which it forms is as great as you state, you ought to blow off at least twice a week, or even oftener. The deposit being a very fine light powder, it will be easily removed in this way.

J. S., of N. Y.—We have had no experience in the use of the New York Gas Company's coke under boilers, and therefore cannot say positively as to its effects upon boilers. Judging from the nature of, and our experience with other coke, we are of the opinion that it would not prove more injurious than coal.

J. K. M., of Ill.—Your theory of terrestrial change and convulsion by the change of the position of the poles of the earth, as a cause of earthquakes and climatic variation, is not new, although new to yourself. It has much to support it but we do not wish to discuss it at present.

S. V., of Pa.—The form of the shadows cast by the planets into celestial space, is not supposed by astronomers to be merely a cone. The shadow consists of two parts, one called the umbra, or perfect shadow, and the penumbra, or partial shadow. It is only the umbra which is conical and terminates at a definite point; the penumbra diverges and extends indefinitely into space. You ought, before criticizing a statement, to post yourself in regard to it.

R. L., of R. I.—A good black japan is made of burnt umber, 4 ounces; true asphaltum, 2 ounces; and boiled oil, 2 quarts. Dissolve the asphaltum at first in a little oil, using a moderate heat; then add the umber, ground in oil, and lastly, the rest of the oil, and incorporate thoroughly. Thin with turpentine. It is a flexible japan and may be used on metal work which requires to be bent somewhat.

NEW BOOKS AND PUBLICATIONS.

A SYSTEM OF INSTRUCTION IN QUANTITATIVE CHEMICAL ANALYSIS. By Dr. C. R. Fresenius, Professor of Chemistry and Natural Philosophy, Wiesbaden. From the last English and German Editions. Edited by Samuel W. Johnson, M.A., Professor of Analytical and Agricultural Chemistry in the Sheffield Scientific School, Yale College, New York: John Wiley & Son, No. 2 Clinton Hall, Astor Place.

The works of Fresenius have attained the enviable position of standard treatises on chemical analysis. Their method is admirable and either as text-books for students or as works of reference for the advanced analysts they are unrivaled. The present edition of the "Quantitative Analysis" has been considerably altered to suit the needs of American students. Its bulk has been reduced by the omission of some processes which the editor tells us in his preface his experience has convinced him are untrustworthy: and by the omission of others which are tedious and unnecessary. The entire chapter on the "Analysis of Mineral Waters" has been suppressed, the editor assuming that those who make extended investigations of this kind have access to the original sources of information. The section on organic analysis has also been reduced one half, without the omission of any useful or instructive processes. Other portions of the work have been also greatly condensed; but the alterations have not been confined solely to the elimination of matter considered unnecessary for American students. Important additions of new methods from the best sources have been made. The old chemical notation is retained, and we are glad that the editor has been in no haste to adopt what, in the minds of many of the best chemists of the age, is, to say the least, of doubtful value.

APPLICATIONS FOR EXTENSION OF PATENTS.

MAKING SEAMLESS METAL TUBES.—William F. Brooks, New York city, has petitioned for an extension of the above patent. Day of hearing March 16, 1870.

CULINARY BOILER.—Edward Whiteley, Cambridge, Mass., has petitioned for an extension of the above patent. Day of hearing March 23, 1870.

SUBMARINE LANTERN.—Charles M. Gould, of Worcester, Mass., and Chas. B. Lamb, Woodstock Conn., has petitioned for the extension of the above patent. Day of hearing. March 23, 1870.

WHIP SOCKET.—W. H. Lyman, Tottenville, N. Y., has applied for an extension of the above patent. Day of hearing March 30, 1870.

MAKING BRASS KETTLES.—O. W. Minard, Johnsville, Pa., has applied for an extension of the above patent. Day of hearing March 30, 1870.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,267.—FASTENING KNOBS OF DOORS, ETC.—C. Bristol, New Haven, Conn. November 15, 1869.

3,446.—ROTARY ENGINE.—G. B. McFarland, New York city. November 29, 1869.

3,563.—PROPELLER.—J. F. Alexander, New York city. December 9, 1869.

3,583.—APPARATUS FOR FOLDING PRINTED SHEETS OF PAPER, AND FOR CUTTING AND FOLDING PRINTED SHEETS OF PAPER AS THEY ISSUE FROM THE PRINTING MACHINE.—Richard M. Hoe, New York city. December 11, 1869.

3,598.—APPARATUS FOR SEWING THE NUMBERS OF A VOLUME IN BOOK-BINDING.—H. G. Thompson and R. Martin, New York city. December 13, 1869.

3,603.—NET MACHINE.—G. B. Lewis and W. M. Ward, East Boston, Mass. December 13, 1869.

3,604.—MANUFACTURE OF IRON AND STEEL.—S. W. Hopkins and F. H. Collins, New York city. December 13, 1869.

3,605.—MODE OF CUTTING VENEERS.—W. H. Williams, New York city. Dec. 13, 1869.

3,613.—HARNESS FOR LOOMS.—A. B. Corey, Providence, R. I. December 14, 1869.

3,616.—ROTARY ENGINE.—H. Olney, R. A. Delong, and J. A. Townsend New York city. Dec. 14, 1869.

3,630.—APPARATUS FOR MAKING AND BREAKING ELECTRO-MAGNETIC CIRCUITS.—E. S. Hidden, Millburn, N. J. December 15, 1869.

3,632.—GRANARIES, ETC.—Geo. H. Johnson, Buffalo, N. Y. December 15, 1869.

3,638.—WOOD-MOLDING AND PANELING MACHINE.—A. S. Gear, New Haven Conn. December 15, 1869.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JAN. 18, 1870.

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98,835.—DEVICE FOR SOLDERING EAVESTROUGHS.—Daniel Asire, Ada, Ohio.

98,836.—LAMP BURNER.—Lewis J. Atwood (assignor to himself, and Holmes, Booth & Haydens), Waterbury, Conn.

98,837.—TOOL HOLDER.—Joseph R. Bailey, Woonsocket, R. I.

98,838.—TOOL HOLDER.—Joseph R. Bailey, Woonsocket, R. I.

98,839.—FORGING AND STAMPING MACHINE.—William Ball, Chicopee, Mass.

98,840.—SHEEP SHEARS.—William B. Barnard, Waterville, Conn.

98,841.—GATE.—Isaac C. Bennett, Clinton, Ill. Antedated January 3, 1870.

98,842.—VAPOR BURNER.—William Bliesner, St. Louis, Mo.

98,843.—COMBINED WIRE CUTTER AND SHEARS.—Charles Brombacher, Tarrytown, N. Y.

98,844.—ROUND COMB.—Elias Brown, Wappinger's Falls, N. Y.

98,845.—WASHING MACHINE.—Milton V. Bulla and J. Benjamin Birdsell, South Bend, Ind.

98,846.—APPARATUS FOR TRANSMITTING POWER BY THE MEDIUM OF AIR.—Horace Call (assignor to himself and J. B. Rand), Concord, N. H.

98,847.—WRENCH.—George J. Capewell, West Cheshire, Conn.

98,848.—DREDGING MACHINE.—Octave Chanute and George S. Morison, Kansas City, Mo.

98,849.—FOOD FOR HORSES AND CATTLE.—Edward Harry Clowser, Boston, Mass.

98,850.—STONE-DRESSING MACHINE.—James Coulter and Herbert Harpin, Huddersfield, England.

98,851.—ADJUSTABLE RECLINING CHAIR.—Claud H. D'Arcus, Detroit, Mich.

98,852.—ICE-CRUSHING TABLE.—Samuel H. Davis and David W. Davis, Detroit, Mich.

98,853.—STILL FOR WHISKEY AND OTHER SPIRITS.—Henry G. Dayton, Dayton, Ohio.

98,854.—EXPLOSIVE COMPOUND.—Carl Dittmar, Charlottenberg, Prussia.

98,855.—CLOTHES WASHER.—James K. Dugdale, White Water, Ind.

98,856.—CLOTHES WASHER.—James K. Dugdale, White Water, Ind.

98,857.—SADDLE BAG.—George W. Elliott, Rocheport, Mo.

98,858.—SOFA BEDSTEAD.—William Farson, Philadelphia, Pa.

98,859.—TRAVELING SLEEPING CUSHION.—Edward G. Fast, Washington, D. C.

98,860.—PAPER BOX.—Franklin Field, Troy, N. Y.

98,861.—HARVESTER RAKE.—Jerome French, Independence, Iowa.

98,862.—COMPOSITION FOR COATING SHIPS, BOATS, ETC.—Edward Vincent Gardner, Oxford street, and Patrick Moiro Crane, Manchester, England. Patented in England, March 13, 1869.

98,863.—SAW HANDLE.—Reuben Gates, Parma, Ohio.

98,864.—UNIVERSAL GEARED JOINTS.—G. F. Green, Kalamazoo, Mich.

98,865.—NON-CONDUCTING COVERING FOR BOILERS, STEAM PIPES, ETC.—Washington Harris, Philadelphia, Pa.

98,866.—BRIDGE.—George P. Herthel, Jun., St. Louis, Mo.

98,867.—STOP FOR THE HINGED FRAME OF RECLINING CHAIR.—James G. Holmes, Charleston, S. C.

98,868.—OAR.—Wm. J. Hough, Martinez, Cal.

98,869.—READING AND WRITING STAND.—George Howell, Baltimore, Md.

98,870.—WRECKING TONGS AND EXCAVATOR.—Robert Hunter, Charleston, S. C.

98,871.—FELTING MACHINE.—Frederick S. Jennings, Danbury, Conn., assignor to himself, Morgan Chittenden, and Henry W. Duryee.

98,872.—SASH STOP OR HOLDER.—James P. Labar, Milford, Mich.

98,873.—STOVEPIPE DRUM.—George W. Lore, Dexter, Mich.

98,874.—METALLIC ALLOY FOR PLOW MOLD BOARDS.—Simon L. Madge, Toledo, Ohio.

98,875.—MEDICAL COMPOUND.—Peter Mays and Price Mays, Clearfield, Pa.

98,876.—HAY KNIFE.—Milo Merrill, Oneida county, N. Y.

98,877.—CIGAR MACHINE.—Frederick Meyer and Henry Schild (assignors to George J. Prentice), New York city; said Prentice assigns to Lewis Prentice, New York city.

98,878.—SERIES OF DIES FOR FORMING AXLES.—Joseph Nicol, Auburn, N. Y., assignor to Sheldon & Co.

98,879.—STOVE.—Benjamin Nott, Albany, N. Y.

98,880.—ELECTRO-MAGNETIC CAR BRAKE.—Joseph Olmsted, Knoxville, Ill.

98,881.—STEAM CULINARY APPARATUS.—Clinton I. Paine, Young America, Ill.

98,882.—HEATING STOVE.—Wm. M. Phelps and Samuel J. Burpee, Marshall, Mich.

98,883.—MODE OF PRODUCING LIGHT BY THE COMBINATION OF SOLID AND LIQUID HYDROCARBONS.—Joseph Phillips, Cologne, Germany.

98,884.—MATERIAL FOR TANNING, DYEING, AND FOR OTHER PURPOSES.—Francis Peyre Porcher, Charleston, S. C.

98,885.—UNIVERSAL JOINT FOR SHAFTING.—Cyrus Roberts, Three Rivers, Mich.

98,886.—CORN PLANTER AND FERTILIZER.—Henry K. Roberts and George E. Roberts, Jefferson county, Ky.

98,887.—HORSE HAY FORK.—Luman Rogers, Pittsburgh, Pa.

98,888.—LEATHER-SPLITTING AND FLESHING MACHINE.—Joseph A. Safford, Winchester, Mass.

98,889.—Machine for Rolling Leather.—Joseph A. Safford, Winchester, Mass.
98,890.—Cigar Machine.—Henry Schild and George J. Prentice, New York city, assignors to George J. Prentice; said Prentice assignor to Lewis Prentice, New York city. Antedated January 10 1870.
98,891.—Current Water Wheel.—Artaxerexes W. Sory, Prairie county, Arkansas.
98,892.—Plant Protector.—Watson N. Sprague, Keene, N. H.
98,893.—Closing Leaks in Hose, Pipes, and Tubes.—Richard Street, Albany, N. Y.
98,894.—Casting Cannon.—John Blake Tarr, Fair Haven, Mass. Antedated January 15, 1870.
98,895.—Locomotive Car Wheel.—John Blake Tarr, Fair Haven, Mass. Antedated January 15, 1870.
98,896.—Watch Case.—Charles L. Thiery, Boston, Mass.
98,897.—Steam Digester for Rendering Lard.—Leonard Thorn, New York city. Antedated May 25, 1868.
98,898.—Machinery for Sawing Lath.—Wm. Tuxworth, Sheridan, Mich.
98,899.—Harness Saddle.— J. L. Van Wert, Tolland, Mass.
98,900.—Apparatus for Rolling Metal.—John I. Williams, Millvale. Pa.
98,901.—Pneumatic Reciprocating Movement.—De Volson Wood, Ann Arbor, Mich. Antedated January 10, 1870.
98,902.—Washing Machine.—Squire Ainsworth, Pittsburgh. Pa.
98,903.—Drawing Knife. — John H. Atwater, Oshtemo, Mich.
98,904.—Needle Case.—Wm. Avery and Albert Fenton, Redditch, England, (assignors to Wm. Avery.
98,905.- Street Urinal.—Moritz Bacharach, New York city.
98,906.- Leather Channeling and Folding Tool.—A. H. Bailey and Wm. G. Bratton, Marseilles, Ill.
98,907.—Combined Latch and Lock.—W. N. Bailey, Duplain, Mich.
98,908.—Scaffold.—George W. Baker, Lincoln, Ill.
98,909.—Harvester Dropper.—W. G. Beels, Independence, Iowa.
98,910.—Harvester.—W. G. Beels, Independence, Iowa.
98,911.—Plastic Roofing Compound.—R. O. Benton, Buffalo, N. Y.
98,912.—Caster for Furniture.—Leopold Bertsche, Allegheny, Pa.
98,913.—Turbine Water Wheel.—Hugh Boyle, Waterloo, Iowa.
98,914.—Fender for Heating Stove.—N. A. Boynton, New York city.
98,915.—Base-Burning Stove.—N. A. Boynton, New York city.
98,916.—Tanning and Stuffing Leather.—Wm. B. Brittingham, La Fayette, Ind.
98,917.—Seal Lock.—F. W. Brooks, New York city.
98,918.—Churn.—S. W. Bruce, Lagrardo, Tenn.
98,919.—Power Loom.—John Bullough, Accrington, Eng. Patented in England, July 28, 1868.
98,920.—Carriage Wheel.—John G. Buzzel, Lynn, Mass. Antedated Jan. 14, 1870.
98,921.—Cotton-Seed Huller.—W. P. Callahan and D. R. De Rush, Dayton, Ohio.
98,922.—Apparatus for Oiling Wool.—T. A. Campbell, New York city.
98,923.—Plate Holder.—John Carlin, New York city.
98,924. Churn.—John Chapple, Jasper, N. Y.
98,925.—Pipe Tongs.—John Clark, Astoria, N. Y.
98,926.—Chair Tip.—Edward Coogan, Washington, D. C.
98,927.—Telegraphic Apparatus.—H. Cook, Paris, France. Antedated Jan. 10, 1870.
98 928.—Skipping Rope.—S. Park Coon, Milwaukee, Wis.
98,929.—Rocking Horse.—Benjamin P. Crandall, New York city.
98,930.—Horse Hay Fork.—Edwin G. Crandall, Belfast, N. Y.
98,931.—Method of Forming T-Bolts.—J. Deeble, Plantsville, Conn.
98,932.—Inclosed Folding Spring Bed.—Louis Derome, San Francisco, Cal.
98,933.—Screw Driver.—David Drummond, McGregor, Iowa.
98,934.—Reclining and Extension Chair.—John Runn (assignor to himself and Jonathan Stone), Charlestown, Mass.
98,935.—Compound Railway Rail.—William B. Dunning, Geneva, N. Y.
98,936.—Lamp Chimney.—R. N. Eagle, Washington, D. C.
98,937.—Lamp Chimney.—R. N. Eagle, Washington, D. C.
98,938.—Butter Excavator.—N. J. Eaton, Montana, Iowa.
98,939.—Washing Machine.—H. L. Ennes, Birmingham, Ohio.
98,940.—Capstan.—John Ericsson, New York city.
98,941.—Washing Machine.—Thos. R. Evans, Blacksburg, Va.
98,942.—Extension Table.—William Farson, Philadelphia, Pa.
98,943.—Screw Tap.—Christian L. Fehrenson, New York city.
98,944.—Corn Sheller.—Samuel Field, Oakham, Mass.
98,945.—Pen.—D. D. Foley, Washington, D. C.
98,946.—Horse Hay Fork.—Emanuel Forney and Jonas Swab, Elizabethville, Pa.
98,947.—Horse-Power.—James Fraser and Wm. Thomas, New York city.
98,948.—Table.—Lambert Freeman, New York city.
98,949.—Putty Knife.—S. W. Gerelds, Worcester, Mass.
98,950.—Portable Water Closet.—Joseph Gilbert, Philadelphia, Pa.
98,951.—Thrashing Machine.—E. A. Goodes, Philadelphia, Pa.
98,952.—Water Elevator.—Matthew D. Gray, Terre Haute, Ind.
98,953.—Breakwater.—Louis Gutekunst, Philadelphia, Pa.
98,954.—Drag Rake.—G. H. Hackett, North Tunbridge, Vt.
98,955.—Machine for Finishing Spokes.—Wm. P. Hale, (assignor to himself and H. Miller), Ionia, Mich.
98,956.—Combined Seeder and Cultivator.—J. A. Hall, Raleigh, Ind.
98,957.—Road Scraper.—Robert Hamilton, Franklin, Ind.
98,958.—Churn.—J. A. Hangor and Geo. C. Hanger, Churchville, Va.
98,959.—Medical Compound.—Mary J. Hanson, Mauston, Wis.
98,960.—Joint for Metal Pipes.—W. H. Harrison, Philadelphia, Pa.
98,961.—Connection for Pipes of Malleable Metal.—W. H. Harrison, Philadelphia, Pa.
98,962.—Lantern.—E. F. Haskell, Sherman, Me.
98,963.—Glass Furnace.—John Henderson, Wheeling, W. Va.
98,964.—Cooking Stove.—C. W. Hermance, Schuylerville, N. Y.
98,965.—Railroad Car Ventilator.—M. T. Hitchcock (assignor to himself and J. W. Labaree), Springfield, Mass.
98,966.—Apparatus for Combing and Preparing Wool, etc.—Edward Holden, Laurel Mount, Baildon, near Leeds, Eng.
98,967.—Car Door Lock.—James L. Howard, Hartford, Conn.
98,968.—Sawing Machine.—S. C. Howe, Allen's Prairie, Mich.
98,969.—Road Scraper.—James Howland, Rock Falls, Ill.
98,970.—Cultivator.—B. S. Hyers, Pekin, Ill.
98,971.—Knob for Permutation Locks.—Henry Isham, New Britain. Conn.
98,972.—Permutation Lock.—F. E. Isham, Hartford, Conn., administratrix of the estate of Henry Isham, deceased.
98,973.—Chair.—W. H. Joeckel, New York city.
98,974.—Lambrequin.—H. M. Johnston, New York city.
98,975.—Grain Cleaner.—Chas. Jones, De Soto, Ill.
98,976.—Tweer.—J. O. Jones (assignor to himself and Chas. Hubbard, Jr.), Brooklyn, E. D., N. Y.
98,977.—Spike Extractor.—William Kegg, Lassellsville, N. Y.
98,978.—Covering for Steps.—C. E. Kemp and J. N. Pattison, Philadelphia, Pa.
98,979.—Flood Gate.—J. J. Kimball, Napierville, Ill.
98,980.—Chimney Cleaner.—G. S. Knapp, Winona, Minn.
98,981.—Railroad Car Window.—G. S. Knapp, Winona, Minn.
98,982.—Showcase for Silks, Cottons, etc.—G. D. Leonard, New York city.
98,983.—Horse Hoe.—N. H. Lindley, Bridgeport, Conn.
98,984.—Fly Trap.—Michael Little, Ashley, Ill.
98,985.—Braiding Attachment for Sewing Machines.—J. M. Lyon, Watertown, N. Y.
98,986.—Oil Can Vent-Spout.—J. J. Marcy (assignor to himself and E. Miller & Co.), Meriden, Conn.
98,987.—Journal Box.—Jeremiah McIlvain, Churchville, Md.
98,988.—Farmers' Boiler.—A. N. Merrill, Batavia, Ill.
98,989.—Clod Fender.—D. O. Moore and Frank Reid, Everton, Ind.
98,990.—Runner Attachment for Carriages.—J. W. Moore, Watseka, Ill.
98,991.—Lock-up Safety Valve.—Wm. Moses, Buffalo, N.Y.
98,992.—Lifting Jack.—C. W. Mosher, East Leon, N. Y.
98,993.—Sled Brake.—L. P. Mosher, Stony Creek, assignor to G. Y. Miller, Luzerne, N. Y.
98,994.—Cooking Stove.—M. J. Mosher, Troy, N. Y.
98,995.—Metallic Cartridge.—Sewell Newhouse, Oneida Community, Oneida, N. Y.
98,996.—Lath Machine.—W. B. Noyes (assignor to himself and C. S. Baker), Manchester, N. H.
98,997.—Feed Cutter.—George Parnell, Ontario, N. Y.
98,998.—Tongue and Thill Coupling.—J. I. Peck, Deansville, N. Y.
98,999.—Corn Sheller.—Rupert Pfeifer, Linz, Austria, assignor to himself and Jacob Nanerth, New Frankfort, Mo.
99,000.—Machine for Grinding Objects Cylindrically.—J. M. Poole (assignor to himself, W. T. Porter, and T. S. Poole), Wilmington, Del.
99 001.—Compression Cock.—Jas. Powell, Cincinnati, Ohio.
99,002.—Self-Cleaning Filter for Hydrants.—John Raible, Matthias Reis, and Johann Ritter, Chicago. Ill.
99,003.—Pipe Coupling for Heating Cars.—H. R. Robbins, Baltimore, Md. Antedated Jan. 8, 1870.
99,004.—Water Wheel.—John Rogers, Rogersville, Pa.
99,005.—Key Hole Guard.—John L. Russell, Prairie City, Iowa.
99,006.—Lumber Rack. — Charles Sach, Grand Rapids, Mich.
99,007.—Alloy of Manganese.—Elliot Savage, West Meriden, Conn.
99,008.—Planing Machine.—John B. Schenck, Matteawan, N. Y.
99,009.—Hand Barrow. — Minot S. Scofield, Stamford, Conn.
99,010.—Fastening Side Boards to Grain Wagons.—Geo. Seitzinger, Seneca, Ill.
99,011.—Bobbin Winder for Sewing Machines.—Thos. Shanks, Baltimore, Md.
99,012.—Lime Kiln.—F. Shelly, Alton, Ill.
99,013.—Lock.—H. S. Shepardson, Shelburne Falls, Mass.
99,014.—Apparatus for Straightening Car Axle.—B. S. Skates, Whistler, Ala.
99,015.—Hot-Air Furnace.—Eli Slater, Philadelphia, Pa.
99,016.—Sewer Excavator.—Francis W. Slater, Bay City, Mich.
99,017.—Bridge.—C. Shaler Smith, C. H. Latrobe, and Frederick H. Smith (assignors to Smith, Latrobe & Company), Baltimore, Md.
99,018.—Rubber Hose.—G. C. Smith (assignor to New York Rubber Company), Fishkill, N. Y.
99,019.—Number Plate for Doors, etc.—James T. Smith, Washington, D. C.
99,020.—Bell Pull.—J. J. C. Smith, Somerville, assignor to the Metallic Compression Casting Company, Boston, Mass.
99,021.—Clothes Sprinkler.—T. Rice Smith and James Mitchell, Jacksonville, Ill.
99,022.—Picture Frame.—John Sperry, New York city.
99,023.—Spring Toy Ball.—Henry Splitdorf (assignor to himself and Jacob Weiss), New York city.
99,024.—Shuttle Driving Mechanism for Looms.—Jeremiah Stever, Bristol, assignor to I. E. Newton, Waterbury, Conn.
99,025.—Thill Coupling.—C. St. James, Pittsfield, Mass.
99,026.—Photographic Camera.—I. H. Stoddard, Ansonia, Conn.
99,027.—Die for Forming Shuttle Tips.—Alson A. Stone, Shirley, Mass.
99,028.—Die for Forming Shuttle Spindle Heads.—A.A. Stone, Shirley, Mass.
99,029.—Washing Machine.—G. W. Stranahan, Westport, N. Y.
99,030.—Bedstead Fastener.—Henry Swineford, Mifflinburg, Pa.
99,031.—Cotton Planter.—E. L. Sykes, Okolona, Miss.
99,032.—Mode of Covering Harness Trimmings.—C. M. Theberath, Newark, N. J.
99,033.—Horse Hay Fork.—F. W. Thorla, Hoskinsville, Ohio.
99,034.—Corn Harvester.—Elwood Tush, Manchester, Iowa.
99,035.—Tie for Hollow Walls.—Edwin Tutte, Fareham, England.
99,036.—Trunk Hasp.—Cornelius Walsh, Newark, N. J.
99,037.—Hydrant.—James Walsh, Philadelphia, Pa.
99,038—Pruning Shears.—P. R. Walsh and J. C. Eaton, Rochester, N. Y.
99,039.—Strike for Locks.—Wm. Weisner (assignor to himself and Claudius Kiefer). Elizabethtown, New Mexico Territory.
99,040.—Summer Cooking Stove.—A. H. Wellington, Woodstock, Vt.
99,041.—Stove Grate.—M. D. Wellman, Allegheny City, Pa.
99,042.—Revolving Grater.—S. S. Wilcox and E. J. Colegrove, Linklaen, N. Y. Antedated Jan. 8, 1870.
99,043.—Wagon.—James S Wilson, Allegheny, assignor to Phelps, Park, & Co., Pittsburgh, Pa.
99,044.—Let Off Mechanism for Looms.—Daniel Long and John Preston, Fairview, Pa.
99,045.—Mold for Vulcanizing Rubber Pencil Tips.—Joseph Banigan and G. W. Miller, Smithfield, R. I.

REISSUES.

87,487.—Purging and Draining Sugar.—Dated March 2, 1869; reissue 3 797.—W. H. Guild, Brooklyn, N. Y.
16,797.—Breech-Loading Fire-Arm.—Dated March 10, 1857; reissue 1,982, dated May 9 1865; reissue 3,798.—W. C. Hicks, Summit, N. J.
84,637.—Stay-Log for Cutting Veneers.—Dated Dec. 1, 1868; reissue 3,799.—J. N. Lyman, New York city.
79,590.—Stove Grate.—Dated July 7, 1868; reissue 3,800—Elie Moneuse and Louis Duparquet. New York city.
94,845.—Cooking Stove.—Dated Sept. 14, 1869; reissue 3,801.—Robert Scorer, Troy, N. Y.
83,336.—Balance Slide Valve.—Dated Oct. 20, 1868; reissue 3,802.—W. M. Stevenson, Newcastle, Pa.
Hinge.—(Design 3.354), dated Jan. 26, 1869; reissue 3,803.—P. Corbin and F. Corbin, New Britain, Conn., assignees of F. T. Fracker.

DESIGNS.

3,818.—Organ or Melodeon Case.—George Cook, New Haven, Conn.
3,819.—Trade Mark.—Robert Kerr and J. P. Kerr, Paisley, Scotland.

EXTENSIONS.

Shirt Collar.—Polloy Hunt and G. W. Hunt, of New York city, administrators of Walter Hunt, deceased.—Letters Patent No. 14,019, dated Jan. 1, 1856.
Making Gum-Elastic Cloth.—Henry G. Tyer, of Andover, Mass., and John Helm, of New Brunswick, N. J.—Letters Patent No. 14,814, dated May 6, 1856, antedated Jan. 9, 1856.
Gas Cooking Stove.—H. B. Musgrave, of Cincinnati, Ohio.—Letters Patent No. 14,064, dated Jan. 8, 1856.